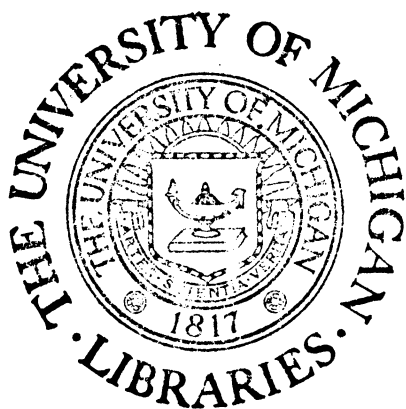


B 407386

THE PHILIPPINE
AGRICULTURAL REVIEW

2
1909
no. 6-9

S
17
.P55



S
1.7
7P55

Vol. II

JUNE, 1909

No. 6

The Philippine Agricultural Review

A MONTHLY PUBLICATION ISSUED IN ENGLISH AND SPANISH AND CIRCULATED FREE OF CHARGE IN THE PHILIPPINE ISLANDS

PRICE OF SUBSCRIPTION

In the United States, \$1, United States currency, per year; in foreign countries in the Postal Union, \$2, United States currency, per year

EDITOR

G. E. NESOM, B.S., D.V.M., *Director of Agriculture*

ASSISTANT EDITORS

CHAS. M. CONNER, B.S.A., B.S.,
Assistant Director of Agriculture

E. A. CODDINGTON, B.S., A.B.,
Superintendent of Publications

PUBLISHED BY THE
BUREAU OF AGRICULTURE
DEPARTMENT OF THE INTERIOR
GOVERNMENT OF THE PHILIPPINE ISLANDS

Applicants for the Philippine Agricultural Review should state whether the English or the Spanish edition is desired. Address all communications relative to this publication to the Director of Agriculture, Manila, P. I.

MANILA
BUREAU OF PRINTING
1909

(Entered at the post-office at Manila as second-class matter.)

Directory of the Bureau of Agriculture.

CENTRAL OFFICE.

Oriente Building, Plaza Calderon de la Barca, Manila.

Director, G. E. NESOM.

Assistant Director,
C. M. CONNER.

Acting Chief Veterinarian,
F. C. GEARHART.

Veterinary Inspector, Manila.
J. R. LOVE.

Superintendent of Agricultural Extension Work,
PABLO TECSON Y OCAMPO.

Superintendent of Publications,
E. A. CODDINGTON.

Statistician,
W. D. HOBART.

Chief, Division of Property and Accounts,
T. R. FLACK.

Chief Clerk, WM. E. COBEY.

Librarian, Miss HARRIET HAYES.

SERUM LABORATORY.

Alabang..... Rizal..... C. G. Thomson, Superintendent.

STOCK FARMS.

Alabang..... Rizal..... H. J. Gallagher, Superintendent.
Trinidad..... Baguio, Benguet..... C. M. Morgan, Superintendent.

EXPERIMENT STATIONS.

Baguio..... Benguet..... M. C. Merrill, Superintendent.
La Carlota..... Occidental Negros..... F. M. Deason, Superintendent.
Lamao..... Bataan..... Orange B. Burrell, Supt.
Singalong..... Manila..... H. A. Ireland, Superintendent.

PROVINCIAL VETERINARY SERVICE.

S. YOUNGBERG, Traveling Veterinary Inspector for Luzon.
R. F. KNIGHT, Traveling Veterinary Inspector for the Visayas.

Albay, Sorsogon.....	B. C. Ray.....	Legaspi.
Ambos Camarines.....	Vacant.....	Goa.
Antique.....	J. C. Keefe.....	San Jose.
Batangas.....	David McKibbin.....	Batangas.
Bohol.....	W. A. Korb.....	Tagbilaran.
Bulacan.....	Vacant.....	Malolos.
Cagayan.....	Paul H. Burnett.....	Tuguegarao.
Capiz.....	Vacant.....	Capiz.
Cebu.....	C. H. Leavitt.....	Cebu.
Ilocos Norte, Ilocos Sur.....	J. L. Gross.....	Laoag.
Iloilo.....	J. E. Nance.....	Iloilo.
Isabela.....	T. I. Miller.....	Iligan.
Leyte, Samar.....	Vacant.....	Palompon.
Marinduque.....	D. C. Kretzer.....	Boac.
Misamis, Surigao.....	J. A. Thompson.....	Cagayan.
Mountain Province.....	C. B. Shoemaker.....	Cervantes.
Occidental Negros.....	Stephen O'Toole.....	La Carlota.
Oriental Negros.....	B. J. Eno.....	Larena.
Nueva Ecija.....	S. H. Sherard.....	San Isidro.
Nueva Vizcaya, Pangasinan.....	J. J. Miller.....	Bayombong.
Pampanga, Tarlac.....	James Hill.....	Tarlac.

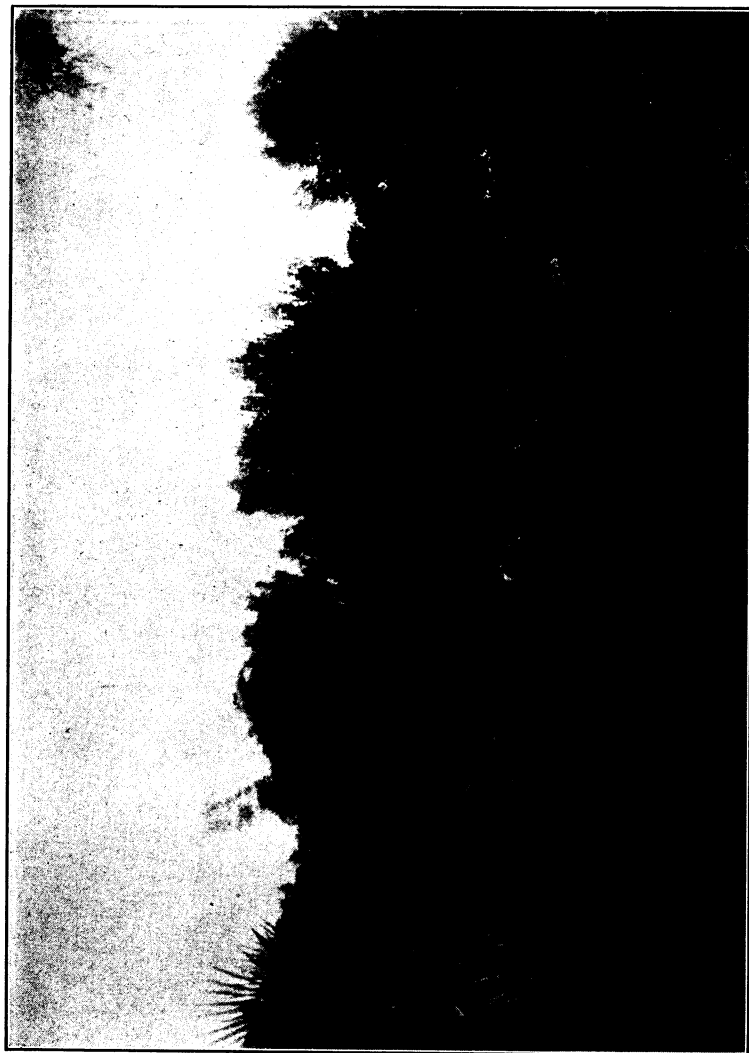


PLATE I.—PHILIPPINE ORANGE, 'NARANJITA,' GROVE IN BATANGAS PROVINCE.

THE PHILIPPINE *Agricultural Review*

VOL. II

JUNE, 1909

No. 6

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	303
How to Transplant a Tree, by Harold Cuzner, Horticulturist.....	309
Orange Cultivation in Batangas, by Mariano M. Cruz, Agricultural Assistant.....	311
The Man Who Works with His Hands, by Theodore Roosevelt.....	317
The Cultivation of the Peanut Plant, by Ramón García Osés, Director of the Río Verde Agricultural Experiment Station, Mexico.....	329
The Cultivation of Theobroma Cacao or Cocoa, by A. Fauchère (continued).....	346
Agricultural Notes.....	353
Crop Reports for March.....	355
Range of Prices of Philippine Agricultural Products.....	358
Periodicals Received in the Library of the Bureau of Agriculture.....	360
Publications of the Bureau of Agriculture.....	362

ILLUSTRATIONS.

PLATE I. Philippine Orange "Naranjita" Grove in Batangas Province.....	Frontispiece.
	Facing page—
II. (a) Effect of the "Dapu," a Parasitic Growth on the Orange Trees in Batangas	314
(b) Effects of "Uhod" or Worms which Eat into the Trunks of the Orange Trees	314

EDITORIAL.

THE MAN WHO WORKS WITH HIS HANDS.

We are glad to present in this number of the REVIEW, following the article on the Country Life Commission in the May number, another article by ex-President Roosevelt on "The Man Who Works with His Hands," or the need of industrial training and education.

When one considers thoughtfully the industrial and economic situation in the Philippines and compares it with the conditions in the United States and other countries, it is seen that there is, after all, little difference in the attitude of mankind in general toward hard manual labor. In the United States, as is clearly pointed out by Mr. Roosevelt, there has been for years a decided tendency on the part of those born and raised

on the farms and in the country to seek the advantage of more thoroughly organized life as it is found in the cities. More than this, it is plainly pointed out that the tendency of education in the United States has been to train boys and girls away from the farm and to teach them to aspire to ideals of life and work which lead them away from the farm and from country life. Last year when addressing the superintendents of the National Educational Association, President Roosevelt charged the superintendents *not to deceive those whom they instructed by holding before their eyes unattainable ideals* and said, "*Statesmen, orators, writers, poets, and captains of industry are mere incidents when compared with the great wing of laborers in the world.*"

In the Philippines we find very much the same fundamental attitude toward hard manual labor as in other countries; here it has been modified and accentuated by the tropical environment and the directing energies shaped by the popular ideals of the Spanish people and the Spanish Government for three hundred years. We are very little in sympathy with the fault found and the repeated charges made against the Filipino people for their lack of inclination to labor and carry on commercial enterprises like those carried on by the people in the temperate climates of Europe and America. There is little to induce the uneducated native of this country to put forth greater energy and to strive for greater organization and development of agricultural and commercial life, especially when he does not understand their advantages and when it is impossible for him, by reason of his environment, to realize their value to human society. When we consider fundamental conditions at home, we find that after all, in a great many cases, the underlying cause of the effort of the masses of so-called energetic Americans is absolute necessity, pride in position, and desire for the mighty dollar in order to meet the needs and the actual demands for one's life and the life of his family. We hardly see how the Filipino who does not understand or realize the advantages of well-organized and advanced agricultural, commercial and social conditions is to be expected to put forth energy comparable with that used by the American or European when his environment supplies almost every need of his daily life as he now lives. It seems to us as much a condition of cause and effect as anything could be—a problem in social and political economy. What we need to do is to stimulate, discipline and educate the people of this country, to let in the light so that they will understand and appreciate these higher social and commercial ideals, and, at the same time, hand in hand with this discipline and education, train their bodies for efficient service along the lines of those activities, occupations and trades which will be open to them with the development of the social, commercial and governmental life of their country, or, as Mr. Roosevelt states, to make of each person *an effective individual as an economic unit*. With the millions of pesos

invested annually for education in the Philippines we believe that the Government has a right and ought to demand such a product from its educational institutions for the money invested. Mr. Roosevelt states that *"our school system has hitherto been well-nigh wholly lacking on the side of industrial training, of the training which fits a man for the shop and the farm.* This is a most serious lack, for no one can look at the peoples of mankind as they stand at present without realizing that industrial training is one of the most potent factors in national development."

While the trades here are carried on almost entirely under the apprentice system, the most of them, from the highly developed standards of the same trades in America and Europe, are in such a crude stage of development as to make them of little value except as a working basis in the régime or condition of affairs which the people of the United States and the Insular Government of the Islands are endeavoring to bring about in promoting what seems to them the best interests of the people and the country and preparing them for that advanced stage and high plane of civilization in which they will be able to conduct the affairs of their own government.

Again, Mr. Roosevelt calls attention to the fact that *"We have tended to regard education as a matter of the head only and the result is that a great many of our people, themselves the sons of men who worked with their hands, seem to think that they rise in the world if they get into positions where they do no hard work whatever; where their hands grow soft, and their working clothes will be kept clean. Such a conception,"* he states, *"is both false and mischievous."* * * * "The calling of the skilled tiller of the soil, the calling of the skilled mechanic, should alike be recognized as professions just as emphatically as the callings of lawyer, of doctor, of banker, or merchant, or clerk. The printer, the electrical worker, the house painter, the foundry man, should be trained just as carefully as the stenographer or the drug clerk." *"To train boys and girls in merely literary accomplishments to the total exclusion of industrial, manual, and technical training tends to unfit them for industrial work; and in real life most work is industrial."* When Mr. Roosevelt states that "there should be libraries, assembly halls, social organizations of all kinds. The school building and the teacher in the school building should throughout the country districts be of the very highest type, able to fit the boys and girls not merely to live in but thoroughly to enjoy and to make the most of the country." That all kinds of agencies, from rural free delivery, good roads, the telephone and the telegraph should be favored and everything done to make it easier for the farmer to lead the most active and efficient intellectual, political, and economic life, he states the needs of the people in the Philippines as well as the people in the United States.

It is interesting to know that he believes that the Department of

Agriculture is, of all the Executive Departments in the Government of the United States, more directly and helpfully in contact with the daily life of the people, and that there is no other Department of the Government whose yield of practical benefits is greater in proportion to the public money expended.

Again he states what should be constantly borne in mind and what should be a guiding principle in the educational work of all the departments of government in these Islands when he says, "We shall never get the right idea of education until we definitely understand that a man may be well trained in book-learning and yet, in the proper sense of the word and for all practical purposes, be utterly uneducated; while a man of comparatively little book-learning may, nevertheless, in essentials have a good education." That *"exactly as the first duty of the normal man is the duty of being the home-maker, so the first duty of the normal woman is the duty of being the home-keeper; and exactly as no other learning is as important for the average man as the learning which will teach him how to make his livelihood, so no other learning is as important for the average woman as the learning which will make her a good housewife and mother."* In conclusion, Mr. Roosevelt states: "No outside training, no coöperation, no Government aid or direction can take the place of a strong and upright character; of goodness of heart combined with clearness of head and that strength and thoroughness of fiber necessary to wring success from a rough work-a-day world. Nothing outside of home can take the place of home. The school is an invaluable adjunct to the home, but it is a wretched substitute for it. No leader in church or state, in science, or art, or industry, however great his achievement, does work that compares in importance with that of the father and mother, 'who are the first of sovereigns and the most divine of priests.'"

ORANGE CULTIVATION IN BATANGAS PROVINCE.

In this number we are glad to present the first descriptive article on the subject of orange cultivation in the Philippines—"Orange Cultivation in Batangas Province," by Mr. Mariano M. Cruz, agricultural assistant in the Bureau of Agriculture. Probably one of the most interesting industries in the Philippines, and certainly one that has aroused the widest interest in different parts of the United States, from Florida to California, is the cultivation of oranges.

While very little has been done, as yet, in a scientific way to investigate the development of the orange industry in these Islands, at the same time it is clearly seen from the statements of Mr. Cruz that the industry is in its very earliest stages and that little or nothing has been done in a scientific way toward its development. The fundamental principles for all agricultural progress, such as the selection of seed, the careful and

systematic cultivation of soils, the use of fertilizers, intelligent pruning and the grafting of trees to secure modified or new varieties of the fruit are apparently unknown to the grower of oranges in the Philippine Islands. However, we believe that the facts presented by Mr. Cruz, covering the number of oranges produced, the principal sections where they are raised, the care given to the trees, the cost of care and cultivation, and the income from the product of these orange groves, as well as the statement concerning the more common enemies and diseases which have been noted, together with some very pertinent and valuable suggestions for improving this industry in Batangas and other provinces, will be of decided interest to our readers and may be the means of indicating to some the large possibilities which there are in the way of developing the orange industry in these Islands.

So far, no obstacle has been discovered, no sufficient reason has been revealed to indicate that the demand of the Insular orange market can not be met by developing the native industry. At present it is well known, as is stated by Mr. Cruz, that large quantities of oranges from China, Florida, California, and other parts of the world supply the Philippine demands for this product.

CULTIVATION OF THE PEANUT PLANT.

In this number of the REVIEW we are presenting a rather interesting article on the cultivation of the peanut plant, by Señor Ramón García Osés, director of the Rio Verde agricultural experiment station in Mexico. The peanut plant is cultivated more or less on a small scale, it is believed, in nearly every part of the Philippine Islands to supply local demands. This industry is, apparently, in very much the same stage as that of raising cacao to supply the local markets. A considerable amount of peanuts is imported from China and a small amount from the United States to supply the demands of the Philippine market.

Señor Osés gives a very interesting account of the cultivated varieties of the peanut plant, so far as they are known, as well as the many uses to which the different parts of it are put; for example, the use of the stems and leaves as forage or food for live stock, and the consumption of the beans as a food by the natives in some sections of Africa. The beans are eaten either green or roasted; they are also used in the manufacture of candies and confections by confectioners. In addition to these uses, Señor Osés states that housewives frequently grind them up and use them in making very palatable creams, puddings, etc.; that when mixed with milk and rice a very appetizing sweet is made; that the flour from the ground peanut bean mixed with an equal quantity of wheat flour, together with yeast and salt, is used to make bread and biscuits; that peanut flour is also mixed with equal parts of flour of cassava or "camoteng cahoy" and when well kneaded and baked makes a very palatable

bread which is an excellent food, while the beans when roasted and mixed with three parts of ground cacao beans make a paste from which chocolate is prepared that is said to be especially good for mothers. In addition to these uses, one of the most important is the use made of the oil which when mixed with olive oil is sold under the name of olive oil; for this product there is an increasing demand, while the residue of the peanut or bean is valued as a fertilizer, particularly for lands on which peanuts are to be raised.

Señor Oses gives a careful discussion of the necessary climatic conditions for peanut culture, the soils and fertilizers which should be used, as well as a very careful and pertinent discussion of the preparation and cultivation of the land, including the selection and planting of seed, the common diseases and enemies of the peanut plant, together with the methods of harvesting and drying, also an estimate of the cost of production and the receipts from the crop, showing the profits which may be obtained from the industry. From all of the conditions laid down for the successful cultivation of the peanut plant we should conclude that it would be an easy matter for enterprising agriculturalists in the Philippines, following the instructions laid down by Señor Oses in this article, to supply the demand of the Philippine market and thus put into circulation in these Islands the considerable sums which are now going principally to China and, on a smaller scale, to the United States for this product.

HOW TO TRANSPLANT A TREE.

By HAROLD CUZNER, *Horticulturist*.

A tree should be transplanted at the period of its life when it is liable to receive the smallest possible injury. This, in this country, is as a general rule at the beginning of the rainy season; except in case the transplanting is to be done at the close of the rainy season before the soil begins to get dry.

If the trees are very young when transplanted they may be dug up carefully, taking care not to injure the roots, and set out where desired. If the trees are of large size it will be found that they will stand moving much better if the roots are pruned several months before taking them up. In large nurseries this is done by an L-shaped blade of steel attached to a plow beam which is run along rather close to the trees cutting the roots, but when only a small number are to be handled the same thing may be accomplished by running a spade down on all sides of the young tree. After this has been done the trees should be left standing where they were growing and the cut surfaces will heal over and put out a number of new small roots which can be preserved when the tree is dug up later on, when it will be found to stand the transplanting with much less injury than if not so treated.

When trees are to be moved but a short distance, they may be taken up with large balls of earth adhering to their roots to prevent their drying out; if this is carefully done the tree will continue to grow without any apparent check.

When trees are to be shipped some distance, however, this becomes impracticable and in this case the roots, as soon as the trees are dug up, should be immediately plunged into a mixture of clay and water about the consistency of thick cream. This mixture is known as "puddle." It has the effect of coating the roots with a layer of mud that prevents the air from drying them out as rapidly as they otherwise would. The trees should then be packed closely in moist sphagnum or wet straw and sent as quickly as possible to their destination.

When the trees are received, if they have been shipped some distance, the bales should be opened up at once and be "heeled in," i. e., set close together in a trench deep enough to take in the roots and part of the stem.

This may be easily done by digging one trench and throwing all of the soil on one side close to the trench. Then set in a row of trees close together and dig soil from the side of the trench opposite to that on which the soil was thrown to cover the roots. In this way a second trench will be formed parallel to the first which will be ready for a second row of trees. The soil should be moist and packed well around the roots, treading it down with the feet. If the trees look at all withered it would be well to have water thrown all over them. The site selected for "heeling in" the trees should be well drained and accessible to the place where the permanent planting is to be made so that they may be pulled out and set as fast as possible.

Before planting, any bruised or injured roots should be cut off with a sharp knife so as to leave a clean smooth surface that will heal over quickly. The cut should be made so that the cut surface will be facing downward rather than to the side or upward.

- Some trees are very sensitive to transplanting and will not grow readily even though the above directions are followed. Among these is the *Cassia florida*, which often fails to grow even though the trees are not more than 5 feet tall and are taken up with a ball of earth 18 inches in diameter, unless great care is taken not to break this ball of earth; while others, like the rain tree, will stand very rough handling.

It will be found, however, that for the great majority of trees the above method will give good results if the planting is well done. The holes must be dug in accordance with the size of the tree to be set out, but in no case should the holes be so small as to cramp the roots of the tree, and they should be deep enough to allow the tree to be set 1 or 2 inches deeper than it originally grew. The soil should be well worked in about the roots and packed firm, but not hard. However, the top layer of soil, to a depth of 2 or 3 inches, should be left loose to act as a mulch and prevent the loss of water from the surface by evaporation. As a general rule one or two years' old seedlings will be found to be the best for transplanting, and older trees should be used only where for some reason it is necessary or urgent to secure results, as the expense of handling large trees is considerable, and the chances of success are smaller.

ORANGE CULTIVATION IN BATANGAS PROVINCE.

By MARIANO M. CRUZ, *Agricultural Assistant.*

The chief orange districts in Batangas are those of Santo Tomás and Tanauan which are both situated in the northeast part of the province. It is some five score or more years since the orange was first known in these localities, and it is believed that it was probably introduced from China. There were at first only about 25 growers and the oranges were very cheap, selling at from 10 to 15 centavos a hundred.

The important crops that used to be grown in connection with the orange were coffee, coconut, and sugar cane. Now that the people have been compelled to abandon the growing of coffee and coconuts on account of the diseases and insects, and because they have lost almost all of their work animals used for the cultivation of sugar cane, many people have completely turned their energies toward the orange industry.

It is estimated that of the 10,017,800 oranges grown on 871 hectares in the entire Philippine Archipelago, Batangas alone produced 6,211,500 from 547 hectares, chiefly in Tanauan as its soil is better adapted to this industry than that of Santo Tomás. The feeling of the people toward agricultural development is more intense than ever before. It has been suggested that the Philippine Legislature must and ought to vote annually for larger appropriations for the Bureau of Agriculture in order that the officials of this Bureau may more fully and thoroughly carry on the work which they have so intelligently and conscientiously undertaken.

KINDS RAISED.

There are two varieties of oranges found in Santo Tomás and Tanauan, namely, "naranjita" and "cajel," the latter being very much less grown on account of the little demand. So that we are more interested in the "naranjita" just now; however, it is hoped that a larger demand for the "cajel" may be created in the future.

GROWING THE YOUNG TREES.

The young seedlings of the orange are usually bought at ₱12 to ₱15 per hundred, when they are about 2 or 3 years old; but there is less expense on the part of the grower should he raise the plants himself as can be seen by the following account: for sowing seeds in pots, one man

at ₱0.60 a day, for one day ₱0.60; for preparing seed beds, two men at ₱0.60 a day, for two days, ₱2.40. The seeds are collected from any fruit found near at hand, without paying attention to the proper selection of seed; following this plan the desirable qualities of the orange will not be improved for a long time, in fact it may be said that such qualities are now being spoiled to some degree. The seeds are sown in large earthen pots about February and planted about 28 to 35 centimeters apart about June or July in a well-prepared seed bed of about 7 meters wide by 12 meters long. The young plants are allowed to remain in this bed until they are 2 or 3 years old, when they are transplanted in a field of a sandy-loam soil, at a distance of from 5 to 8 meters from each other. In transplanting advantage is taken of the rainy season, so that there will be no necessity for artificial irrigation. In order that the field may be kept free from "cogon" it is sometimes sown to rice, corn, peanuts, or mongo for six years while the orange trees are not bearing; these crops rather more than pay the cost of cultivating the land during the six years.

About May or June of the seventh year of growth, the orange trees will begin to bloom, and ripen their first fruit from September to December. At present this fruit brings from 30 to 40 centavos a hundred on the tree. The purchaser harvesting and transporting the crop to Calamba, Laguna, the nearest present port, where they sell at ₱0.60 to ₱1 per hundred, after paying about ₱8 to ₱11 per carretón for carting—a carretón will carry from four to six baskets containing 500 oranges each. Though this method of transportation is normally slow it is made worse by the existing bad condition of that portion of the road belonging to the Province of La Laguna, and the growers are patiently looking forward to the time when their oranges can be transported by the railroad which should soon be completed.

CARE OF THE TREES.

In growing oranges, such work as cultivating and manuring the soil and pruning the trees is almost wholly unknown, making the trees less productive and probably less able to resist the attacks of insects and diseases. The land about the orange trees should be cultivated every dry season, beginning when the trees are first set out so as to cover and protect their roots from the heat of the sun and to render the elements of plant food in the soil more available. It is the belief of some people that animal manure burns the roots of the trees, thus killing them; of course, this is partially true if the manure is applied when it is fresh, but should it be applied after it has well rotted, about 2 feet from the trees, the result would be decidedly beneficial. In this connection, commercial fertilizers could be used to good advantage by applying to each tree about 2 or 3 pounds of fertilizer containing from 6 to 8 per cent of phosphoric

acid, from 8 to 12 per cent of potash, and $3\frac{1}{2}$ to 4 per cent of nitrogen, as in the following formulas:

For young trees:		Pounds.
Acid phosphate		800
Sulphate of potash		314
Nitrate of soda		500
For bearing trees:		
Acid phosphate		1,066
Sulphate of potash		470
Nitrate of soda		466

The above formulas are recommended by H. Harold Hume, of the University of Florida, in his book on "Citrus Fruits and Their Culture." On examination we find that the consumption of nitrogenous material is decreased as the trees become older; this is due to the fact that nitrogen is used mainly in the production of vigorous leaves and branches while the trees are young; and in turn the potash and phosphoric compounds are increased while the trees become older as these elements are largely used in the production of fruit. In using all kinds of fertilizers it should be remembered that the soil must first be cultivated, otherwise a crust will be formed on the surface of the soil making the fertilizer unavailable for the trees.

For the purpose of checking the growth of certain portions of the tree or causing the crown to spread it is a common practice to hang stones from the branches or place them in the crotch between the main branches. While this may accomplish the desired result to a certain degree, a careful pruning of the extra and undesirable branches will accomplish the desired results in a much more satisfactory manner.

ENEMIES AND DISEASES.

While several orange diseases have been found, a gummosis disease, "lumuluha," which attacks the lower portion of the trees, producing tears of a gummy substance, is probably the most important one. The best remedy so far known for this disease is simply cutting off smoothly the infected portion and applying to it afterwards an antiseptic lime wash. The insects that are oftentimes troublesome are, first, the "ataña," a fly which attacks the fruit stalks and causes the oranges to drop off in great numbers; then, the "uhod," probably the larva of a small beetle which generally attacks the portion of the trunk affected with gummosis by eating its way into the bark and wood; about 10 to 20 per cent of these trees are destroyed inside of from three to five years. The bearing period of the trees continues until they are about 30 or 35 years old. To drive away the "ataña" the people smudge the trees by burning rubbish under them which probably does some good; but the best remedy would probably be to spray the trees with a Paris green solution while the fruits are still young. In the case of the "uhod," whitewashing the trunk or

painting the trunk with tree tangle-foot would probably be the most effective. Another common pest in the orange groves of the province is the "dapu" (mistletoe), a parasitic plant which eventually kills the branches it attacks. To destroy the "dapu" it is best to gather it all and burn it completely so as to avoid further production of its seeds. Large numbers of oranges are lost through heavy winds, but much of the damage could be avoided by the use of windbreaks. There are many native trees which might serve the purpose, among which are the "agoho" (*Casuarina equisetifolia*) and "madre cacao" (*Gliricida maculata*).

PRINCIPAL ORCHARDS.

The most important barrios growing oranges in Santo Tomás are San Vicente, San Roque, San Pedro, San Pablo, San Felix, and San José, all of which are situated southeast of the town; and the principal orange growers are Señores Miguel Malvar, Eustacio Maloles, Máximo Malvar, Victoriano Villegas, Arcadio Sanchez, and Pedro Torres. In this connection, I might say a few words concerning General Malvar, with whom I had the honor to speak about the orange industry. General Malvar is one of the most energetic, if not the first, of Filipino agriculturists. It is to him that I am indebted for most of my data in this paper.

In Tanauan the important barrios engaged in this industry are Boncolot, Natatas, Balele, Boot, Santor and Janopol; while the principal growers are Doña Jacoba García, Sr. Sixto Castillo, Sr. Prospero Dimayuga, Sr. Nicolás González, Sr. Ruperto Laurel, Señora María Tapia, and others. The average size of an orange grove in bearing in both places ranges from 15 ares to about 75 ares (from about one-third acre to about $1\frac{3}{4}$ acres); but seven years hence it is estimated that the groves will be more than double that size.

COST OF CULTIVATION.

In discussing the orange industry of Batangas an estimate of the expense of an orange grove of 1 hectare will doubtless be of interest.

EXPENSES THE FIRST YEAR.

One hectare of land, ₱80 to ₱150.....	₱115.00
Tools, "tactac" (small crowbar), ₱0.40; "dulos" (hoe), ₱0.80; "taisin" (weeder), ₱0.50, and bolo, ₱1.20.....	2.90
Clearing of land, 5 men at ₱0.60 a day for six days.....	18.00
150 young trees, ₱10 per hundred, and planting at ₱0.03 per tree.....	19.50
Land tax for six years at six-eighths of 1 per cent of the assessed value....	5.16
Total expense	160.56

EXPENSES SEVENTH YEAR.

Tax at six-eighths of 1 per cent on valuation.....	₱0.86
Weeding, cleaning, etc.....	7.87
Total expense	8.73

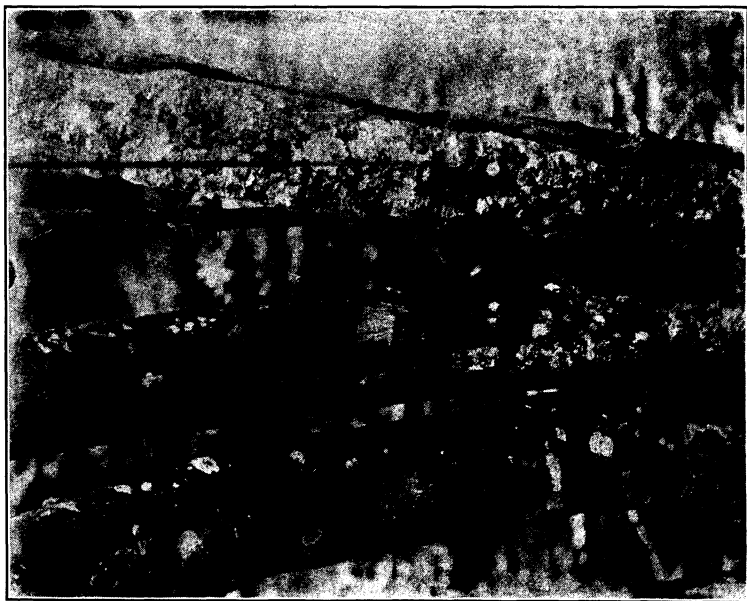


PLATE II.—(a) THE EFFECT OF THE "DAPU" A PARASITIC
GROWTH ON THE ORANGE TREES IN BATANGAS.



PLATE II.—(b) THE EFFECT OF "UHOD" OR WORMS WHICH
EAT INTO THE TRUNKS OF THE ORANGE TREES.

INCOME SEVENTH YEAR.

From 140 to 160 trees, at 20 to 100 fruits each, giving 9,000 fruits, at ₱0.30 a hundred	₱31.50
Total expense	8.73
Net profit	22.77

EXPENSES TENTH YEAR.

Tax at six-eighths of 1 per cent on valuation.....	₱0.86
Weeding, cleaning, etc.....	72.18
Total expense account	73.04

INCOME TENTH YEAR.

From 140 to 160 trees, at 200 to 900 fruits each, giving altogether 82,500 fruits, at ₱0.30 to ₱0.40 a hundred.....	₱288.75
Total expense	73.04
Net profit	215.71

EXPENSES FIFTEENTH YEAR.

Tax at six-eighths of 1 per cent on valuation.....	₱0.88
Weeding, cleaning, etc.....	335.62
Total expenses	336.48

INCOME FIFTEENTH YEAR.

From 140 to 160 trees, at 1,000 to 4,000 each, giving altogether 375,000 fruits, at ₱0.30 to ₱0.40 a hundred.....	₱1,312.50
Total expense	336.48
Net profit	976.02

NEW VARIETIES NEEDED.

Probably the most important thing that could be suggested toward the improvement of the orange industry in Batangas is the extension of the season by the introduction or creation of early and late varieties of oranges. A late variety might prove particularly satisfactory as its fruit would be welcomed during the long, hot, dry season. But such work, however, can not be done in a single year as it requires careful breeding and selection so that in all probability it would take about fifteen years, more or less, to obtain definite results. For this reason it is rather difficult for the private individual to undertake the work, and it would be highly desirable to have a Government station in the neighborhood where such work could be systematically carried on. Should this plan be carried out, other questions, such as those of cultivation, fertilizers, pruning, combating of insects and diseases, windbreaks, irrigation, storage, uses, etc., could all be studied at the same time. Such a station as this must and ought to be encouraged by all who are really interested in the agricultural development of the country. The growers ought to

form an association for the promotion of the industry, and there seems to be no reason why it could not be so developed as to have an export rather than an import trade. At present hundreds of thousand of oranges are imported annually into this country from China, California, and other countries of the world, where orange growing is done on a commercial basis.

THE MAN WHO WORKS WITH HIS HANDS.¹

By THEODORE ROOSEVELT.

OUR EDUCATIONAL SYSTEM AND WHAT IT LACKS.

As a people there is nothing in which we take a juster pride than our educational system. It is our boast that every boy or girls has the chance to get a school training; and we feel it is a prime national duty to furnish this training free, because only thereby can we secure the proper type of citizenship in the average American. Our public schools and our colleges have done their work well, and there is no class of our citizens deserving of heartier praise than the men and women who teach in them.

Nevertheless, for at least a generation we have been waking to the knowledge that there must be additional education beyond that provided in the public school as it is managed to-day. *Our school system has hitherto been well-nigh wholly lacking on the side of industrial training, of the training which fits a man for the shop and the farm. This is a most serious lack, for no one can look at the peoples of mankind as they stand at present without realizing that industrial training is one of the most potent factors in national development.* We of the United States must develop a system under which each individual citizen shall be trained so as to be *effective individually as an economic unit*, and fit to be organized with his fellows so that he and they can work in efficient fashion together. This question is vital to our future progress, and public attention should be focused upon it. Surely it is eminently in accord with the principles of our democratic life that we should furnish the highest average industrial training for the ordinary skilled workman. *But it is a curious thing that in industrial training we have tended to devote our energies to producing high-grade men at the top rather than in the ranks.* Our engineering schools, for instance, compare favorably with the best in Europe, whereas *we have done almost nothing to equip the private soldiers of the industrial army—the mechanic, the metal-worker, the carpenter. Indeed, too often our schools train away from the shop and the forge; and this fact, together with the abandonment of the old apprentice system, has resulted in such an absence of facilities for providing trained journeymen that in many of our trades almost all*

¹ Circular No. 24, United States Department of Agriculture.

the recruits among the workmen are foreigners. Surely this means that there must be some systematic method provided for training young men in the trades, and that this must be coördinated with the public school system. No industrial school can turn out a finished journeyman; but it can furnish the material out of which a finished journeyman can be made, just as an engineering school furnishes the training which enables its graduates speedily to become engineers.

We hear a great deal of the need of protecting our workingmen from competition with pauper labor. I have very little fear of the competition of pauper labor. The nations with pauper labor are not the formidable industrial competitors of this country. *What the American workingman has to fear is the competition of the highly skilled workingman of the countries of greatest industrial efficiency.* By the tariff and our immigration laws we can always protect ourselves against the competition of pauper labor here at home; but when we contend for the markets of the world we can get no protection, and we shall then find that our most formidable competitors are the nations in which there is the most highly developed business ability, the most highly developed industrial skill; and these are the qualities which we must ourselves develop.

DIGNITY AND IMPORTANCE OF LABOR.

We have been fond as a Nation of speaking of the dignity of labor, meaning thereby manual labor. Personally I don't think that we begin to understand what a high place manual labor should take; and it never can take this high place unless it offers scope for the best type of man. *We have tended to regard education as a matter of the head only, and the result is that a great many of our people, themselves the sons of men who worked with their hands, seem to think that they rise in the world if they get into a position where they do no hard manual work whatever; where their hands will grow soft, and their working clothes will be kept clean. Such a conception is both false and mischievous.* There are, of course, kinds of labor where the work must be purely mental, and there are other kinds of labor where, under existing conditions, very little demand indeed is made upon the mind, though I am glad to say that I think the proportion of men engaged in this kind of work is diminishing. But in any healthy community, in any community with the great solid qualities which alone make a really great nation, the bulk should do work which makes demands upon both the body and the mind. Progress can not permanently consist in the abandonment of physical labor, but in the development of physical labor so that it shall represent more and more the work of the trained mind in the trained body. To provide such training, to encourage in every way the production of the men whom it alone can produce, is to show that as a nation we have a true conception of the dignity and importance of labor. *The calling of the skilled tiller*

of the soil, the calling of the skilled mechanic, should alike be recognized as professions, just as emphatically as the calling of lawyer, of doctor, of banker, merchant, or clerk. The printer, the electrical worker, the house painter, the foundry man, should be trained just as carefully as the stenographer or the drug clerk. They should be trained alike in head and in hand. They should get over the idea that to earn twelve dollars a week and call it "salary" is better than to earn twenty-five dollars a week and call it "wages." The young man who has the courage and the ability to refuse to enter the crowded field of the so-called professions and to take to constructive industry is almost sure of an ample reward in earnings, in health, in opportunity to marry early, and to establish a home with reasonable freedom from worry. We need the training, the manual dexterity, and industrial intelligence which can be best given in a good agricultural, or building, or textile, or watchmaking, or engraving, or mechanical school. It should be one of our prime objects to put the mechanic, the wage-worker who works with his hands, and who ought to work in constantly larger degree with his head, on a higher plane of efficiency and reward, so as to increase his effectiveness in the economic world, and therefore the dignity, the remuneration, and the power of his position in the social world. To train boys and girls in merely literary accomplishments to the total exclusion of industrial, manual, and technical training tends to unfit them for industrial work; and in real life most work is industrial.

The problem of furnishing well-trained craftsmen, or rather journeymen fitted in the end to become such, is not simple—few problems are simple in the actual process of their solution—and much care and forethought and practical common sense will be needed, in order to work it out in a fairly satisfactory manner. It should appeal to all our citizens. I am glad that societies have already been formed to promote industrial education, and that their membership includes manufacturers and leaders of labor unions; educators and publicists, men of all conditions who are interested in education and in industry. It is such coöperation that offers most hope for a satisfactory solution of the question as to what is the best form of industrial school, as to the means by which it may be articulated with the public school system, and as to the way to secure for the boys trained therein the opportunity to acquire in the industries the practical skill which alone can make them finished journeymen.

THE FARMER IN RELATION TO THE WELFARE OF THE WHOLE COUNTRY.

There is but one person whose welfare is as vital to the welfare of the whole country as is that of the wage-worker who does manual labor, and that is the tiller of the soil—the farmer. If there is one lesson taught by history it is that *the permanent greatness of any State must ultimately depend more upon the character of its country population*

than upon anything else. No growth of cities, no growth of wealth, can make up for a loss in either the number or the character of the farming population. In the United States more than in almost any other country we should realize this and should prize our country population. When this Nation began its independent existence it was as a Nation of farmers. The towns were small and were for the most part mere seacoast trading and fishing ports. The chief industry of the country was agriculture, and the ordinary citizen was in some way connected with it. In every great crisis of the past a peculiar dependence has had to be placed upon the farming population; and this dependence has hitherto been justified. But it can not be justified in the future if agriculture is permitted to sink in the scale as compared with other employments. We can not afford to lose that preëminently typical American, *the farmer who owns his own farm.*

ECONOMIC AND SOCIAL FACTORS AFFECTING RURAL POPULATIONS.

Yet it would be idle to deny that in the last half century there has been in the eastern half of our country a falling off in the relative condition of the tillers of the soil, although signs are multiplying that the Nation has waked up to the danger and is preparing to grapple effectively with it. East of the Mississippi and north of the Ohio and the Potomac there has been on the whole an actual shrinkage in the number of the farming population since the civil war. In the States of this section there has been a growth of population—in some an enormous growth—but the growth has taken place in the cities, and especially in the larger cities. This has been due to certain economic factors, such as the extension of railroads, the development of machinery, and the openings for industrial success afforded by the unprecedented growth of cities. The increased facility of communication has resulted in the withdrawal from rural communities of most of the small, widely distributed manufacturing and commercial operations of former times, and the substitution therefor of the centralized commercial and manufacturing industries of the cities.

The chief offset to the various tendencies which have told against the farm has hitherto come in the rise of the physical sciences and their application to agricultural practices or to the rendering of country conditions more easy and pleasant. But these countervailing forces are as yet in their infancy. As compared with a few decades ago, the social or community life of country people in the East compares less favorably than it formerly did with that of the dwellers in cities. Many country communities have lost their social coherence, their sense of community interest. In such communities the country church, for instance, has gone backward both as a social and a religious factor. Now, we can not too strongly insist upon the fact that it is quite as unfortunate to have any social as well as any economic falling off. It would be a calamity to have our farms occupied by a lower type of people than the hard-

working, self-respecting, independent, and essentially manly men and womanly women who have hitherto constituted the most typically American, and on the whole the most valuable, element in our entire Nation. Ambitious native-born young men and women who now tend away from the farm must be brought back to it, and therefore they must have social as well as economic opportunities. Everything should be done to encourage the growth in the open farming country of such institutional and social movements as will meet the demand of the best type of farmers. *There should be libraries, assembly halls, social organizations of all kinds. The school building and the teacher in the school building should, throughout the country districts, be of the very highest type, able to fit the boys and girls not merely to live in but thoroughly to enjoy and to make the most of the country. The country church must be revived. All kinds of agencies, from rural free delivery to the bicycle and the telephone, should be utilized to the utmost; good roads should be favored; everything should be done to make it easier for the farmer to lead the most active and effective intellectual, political, and economic life.*

There are regions of large extent where all this, or most of this, has already been realized; and while this is perhaps especially true of great tracts of farming country west of the Mississippi, with some of which I have a fairly intimate personal knowledge, it is no less true of other great tracts of country east of the Mississippi. In these regions the church and the school flourish as never before; there is a more successful and more varied farming industry; the social advantages and opportunities are greater than ever before; life is fuller, happier, more useful; and though the work is more effective than ever, and in a way quite as hard, it is carried on so as to give more scope for well-used leisure. My plea is that we shall all try to make more nearly universal the conditions that now obtain in the most favored localities.

PROGRESS IN AGRICULTURAL SCIENCE.

Nothing in the way of scientific work can ever take the place of business management on a farm. We ought all of us to teach ourselves as much as possible; but we can also all of us learn from others; and the farmer can best learn how to manage his farm even better than he now does by practice, under intelligent supervision, on his own soil in such a way as to increase his income. This is the kind of teaching which has been carried on in Texas, Louisiana, and Arkansas by Doctor Knapp, of the National Department of Agriculture. But much has been accomplished by the growth of what is broadly designated as agricultural science. This has been developed with remarkable rapidity during the last quarter of a century, and the benefit to agriculture has been great. As was inevitable, there was much error and much repetition of work in the early application of money to the needs of agricultural

colleges and experiment stations alike by the Nation and the several States. Much has been accomplished; but much more can be accomplished in the future. The prime need must always be for real research, resulting in scientific conclusions of proved soundness. Both the farmer and the legislature must beware of invariably demanding immediate returns from investments in research efforts. It is probably one of our faults as a Nation that we are too impatient to wait a sufficient length of time to accomplish the best results; and in agriculture effective research often, although not always, involves slow and long-continued effort if the results are to be trustworthy. While applied science in agriculture as elsewhere must be judged largely from the standpoint of its actual return in dollars, yet the farmers no more than anyone else can afford to ignore the large results that can be enjoyed because of broader knowledge. The farmer must prepare for using the knowledge that can be obtained through agricultural colleges by insisting upon a constantly more practical curriculum in the schools in which his children are taught. He must not lose his independence, his initiative, his rugged self-sufficiency; and yet he must learn to work in the heartiest coöperation with his fellows.

EDUCATIONAL AND RESEARCH WORK OF THE DEPARTMENT OF AGRICULTURE.

The corner stones of our unexampled prosperity are, on the one hand, *the production of raw material*, and *its manufacture and distribution* on the other. These two great groups of subjects are represented in the National Government principally by the Departments of Agriculture and of Commerce and Labor. The production of raw material from the surface of the earth is the sphere in which the Department of Agriculture has hitherto achieved such notable results. *Of all the Executive Departments there is no other, not even the Post-Office, which comes into more direct and beneficent contact with the daily life of the people than the Department of Agriculture, and none whose yield of practical benefits is greater in proportion to the public money expended.*

But great as its services have been in the past, the Department of Agriculture has a still larger field of usefulness ahead. It has been dealing with growing crops. It must hereafter deal also with living men. *Hitherto agricultural research, instruction, and agitation have been directed almost exclusively toward the production of wealth from the soil. It is time to adopt in addition a new point of view. Hereafter another great task before the National Department of Agriculture and the similar agencies of the various States must be to foster agriculture for its social results, or, in other words, to assist in bringing about the best kind of life on the farm for the sake of producing the best kind of men.* The Government must recognize the far-reaching importance of the study and treatment of the problems of farm life alike from the social and the economic

standpoints; and the Federal and State Departments of Agriculture should coöperate at every point.

The farm grows the raw material for the food and clothing of all our citizens; it supports directly almost half of them; and nearly half the children of the United States are born and brought up on farms. How can the life of the farm family be made less solitary, fuller of opportunity, freer from drudgery, more comfortable, happier, and more attractive? Such a result is most earnestly to be desired. *How can life on the farm be kept on the highest level, and where it is not already on that level, be so improved, dignified, and brightened as to awaken and keep alive the pride and loyalty of the farmer's boys and girls, of the farmer's wife, and of the farmer himself? How can a compelling desire to live on the farm be aroused in the children that are born on the farm?* All these questions are of vital importance not only to the farmer but to the whole Nation; and the Department of Agriculture must do its share in answering them.

The drift toward the city is largely determined by the superior social opportunities to be enjoyed there, by the greater vividness and movement of city life. Considered from the point of view of national efficiency, the problem of the farm is as much a problem of attractiveness as it is a problem of prosperity. It has ceased to be merely a problem of growing wheat and corn and cattle. The problem of production has not ceased to be fundamental, but it is no longer final; just as learning to read and write and cipher are fundamental, but are no longer the final ends of education. We hope ultimately to double the average yield of wheat and corn per acre; it will be a great achievement; but it is even more important to double the desirability, comfort, and standing of the farmer's life.

We must consider, then, not merely how to produce, but also how production affects the producer. In the past we have given but scant attention to the social side of farm life. We should study much more closely than has yet been done the social organization of the country, and inquire whether its institutions are now really as useful to the farmer as they should be, or whether they should not be given a new direction and a new impulse, for no farmer's life should lie merely within the boundary of his farm. This study must be of the East and the West, the North and the South; for the needs vary from place to place.

First in importance, of course, comes the effort to secure the mastery of production. Great strides toward this end have already been taken over the larger part of the United States; much remains to be done, but much has been done; and the debt of the Nation to the various agencies of agricultural improvement for so great an advance is not to be overstated. But we can not halt here. The benefits of high social organization include such advantages as ease of communication, better educational facilities, increased comfort of living, and those opportunities for

social and intellectual life and intercourse, of special value to the young people and to women, which are as yet chiefly to be had in centers of population. All this must be brought within the reach of the farmers who live on the farms, of the men whose labor feeds and clothes the towns and cities.

BENEFITS RESULTING FROM COÖPERATION.

Farmers must learn the vital need of coöperation with one another. Next to this comes coöperation with the Government, and the Government can best give its aid through associations of farmers rather than through the individual farmer; for there is no greater agricultural problem than that of delivering to the farmer the large body of agricultural knowledge which has been accumulated by the National and State Governments and by the agricultural colleges and schools. Nowhere has the Government worked to better advantage than in the South, where the work done by the Department of Agriculture in connection with the cotton growers of the Southwestern States has been phenomenal in its value. The farmers in the region affected by the boll weevil, in the course of the efforts to fight it, have succeeded in developing a most scientific husbandry, so that in many places the boll weevil became a blessing in disguise. Not only did the industry of farming become of very much greater economic value in its direct results, but it became immensely more interesting to thousands of families. The meetings at which the new subjects of interest were discussed grew to have a distinct social value, while with the farmers were joined the merchants and bankers of the neighborhood. It is needless to say that every such successful effort to organize the farmer gives a great stimulus to the admirable educational work which is being done in the Southern States, as elsewhere, to prepare young people for an agricultural life. It is greatly to be wished that the communities whence these students are drawn and to which they either return or should return could be coöperatively organized; that is, that associations of farmers could be organized, primarily for business purposes, but also with social ends in view. This would mean that the returned students from the institutions of technical learning would find their environment prepared to profit to the utmost by the improvements in technical methods which they had learned.

The people of our farming regions must be able to combine among themselves, as the most efficient means of protecting their industry from the highly organized interests which now surround them on every side. A vast field is open for work by coöperative associations of farmers in dealing with the relation of the farm to transportation and to the distribution and manufacture of raw materials. It is only through such combination that American farmers can develop to the full their economic and social power. Combination of this kind has, in Denmark, for instance, resulted in bringing the people back to the land, and has enabled

the Danish peasant to compete in extraordinary fashion, not only at home but in foreign countries, with all rivals.

KIND OF EDUCATION NEEDED.

Agricultural colleges and farmers' institutes have done much in instruction and inspiration; they have stood for the nobility of labor and the necessity of keeping the muscles and the brain in training for industry. They have developed technical departments of high practical value. They seek to provide for the people on the farms an equipment so broad and thorough as to fit them for the highest requirements of our citizenship; so that they can establish and maintain country homes of the best type, and create and sustain a country civilization more than equal to that of the city. The men they train must be able to meet the strongest business competition, at home or abroad, and they can do this only if they are trained not alone in the various lines of husbandry but in successful economic management. These colleges, like the State experiment stations, should carefully study and make known the needs of each section, and should try to provide remedies for what is wrong.

The education to be obtained in these colleges should create as intimate relationship as is possible between the theory of learning and the facts of actual life. Educational establishments should produce highly trained scholars, of course; but in a country like ours, where the educational establishments are so numerous, it is folly to think that their main purpose is to produce these highly trained scholars. Without in the least disparaging scholarship and learning—on the contrary, while giving hearty and ungrudging admiration and support to the comparatively few whose primary work should be creative scholarship—it *must be remembered that the ordinary graduate of our colleges should be and must be, primarily, a man and not a scholar. Education should not confine itself to books. It must train executive power, and try to create that right public opinion which is the most potent factor in the proper solution of all political and social questions.* Book-learning is very important, but it is by no means everything; and *we shall never get the right idea of education until we definitely understand that a man may be well trained in book-learning and yet, in the proper sense of the word and for all practical purposes, be utterly uneducated; while a man of comparatively little book-learning may, nevertheless, in essentials have a good education.*

IMPROVEMENT OF CONDITIONS AFFECTING COUNTRY LIFE.

It is true that agriculture in the United States has reached a very high level of prosperity; but we can not afford to disregard the signs which teach us that there are influences operating against the establishment or retention of our country life upon a really sound basis. The over-extensive and wasteful cultivation of pioneer days must stop and give place

to a more economical system. Not only the physical but the ethical needs of the people of the country districts must be considered. In our country life there must be social and intellectual advantages as well as a fair standard of physical comfort. *There must be in the country, as in the town, a multiplication of movements for intellectual advancement and social betterment. We must try to raise the average of farm life, and we must also try to develop it so that it shall offer exceptional chances for the exceptional man.*

Of course the essential things after all are those which concern all of us as men and women, no matter whether we live in the town or the country, and no matter what our occupations may be. The root problems are much the same for all of us, widely though they may differ in outward manifestation. The most important conditions that tell for happiness within the home are the same for the town and the country; and the relations between employer and employee are not always satisfactory on the farm any more than in the factory. All over the country there is a constant complaint of paucity of farm labor. Without attempting to go into all the features of this question I would like to point out that you can never get the right kind, the best kind, of labor if you offer employment only for a few months, for no man worth anything will permanently accept a system which leaves him in idleness for half the year.

A WORD REGARDING THE FARMER'S FAMILY.

And most important of all, I want to say a special word on behalf of the one who is too often the very hardest worked laborer on the farm—the farmer's wife. Reform, like charity, while it should not end at home, should certainly begin there; and the man whether he lives on a farm or in a town, who is anxious to see better social and economic conditions prevail through the country at large, should be exceedingly careful that they prevail first as regards his own womankind. I emphatically believe that for the great majority of women the really indispensable industry in which they should engage is in the industry of the home. *There are exceptions, of course; but exactly as the first duty of the normal man is the duty of being the home-maker, so the first duty of the normal woman is to be the home-keeper; and exactly as no other learning is as important for the average man as the learning which will teach him how to make his livelihood, so no other learning is as important for the average woman as the learning which will make her a good housewife and mother.* But this does not mean that she should be an overworked drudge. I have hearty sympathy with the movement to better the condition of the average tiller of the soil, of the average wageworker, and I have an even heartier sympathy and applause for the movement which is to better the condition of their respective wives. There is plenty that is hard and rough and disagreeable in the necessary

work of actual life; and under the best circumstances, and no matter how tender and considerate the husband, the wife will have at least her full share of work and worry and anxiety; but if the man is worth his salt he will try to take as much as possible of the burden off the shoulders of his helpmate. There is nothing Utopian in the movement; all that is necessary is to strive toward raising the average, both of men and women, to the level on which the highest type of family now stands, among American farmers, among American skilled mechanics, among American citizens generally; *for in all the world there is no better and healthier home life, no finer factory of individual character, nothing more representative of what is best and most characteristic in American life than that which exists in the higher type of American family; and this higher type of family is to be found everywhere among us, and is the property of no special group of citizens.*

The best crop is the crop of children; the best products of the farm are the men and women raised thereon; and the most instructive and practical treatises on farming, necessary though they be, are no more necessary than the books which teach us our duty to our neighbor, and above all to the neighbor who is of our own household. You young men and women of the agricultural and industrial colleges and schools—and, for that matter, you who go to any college or school—must have some time for light reading; and there is some light reading quite as useful as heavy reading, provided, of course, that you do not read in a spirit of mere vacuity. Aside from the great classics, and thinking only of the many healthy and stimulating books of the day, it is easy to pick out many which can really serve as tracts, because they possess what many avowed tracts and treatises do not, the prime quality of being interesting. You will learn the root principles of self-help and helpfulness toward others from “Mrs. Wiggs of the Cabbage Patch” just as much as from any formal treatise on charity; you will learn as much sound social and industrial doctrine from Octave Thanet’s stories of farmers and wage-workers as from avowed sociological and economic studies; and I cordially recommend the first chapter of “Aunt Jane of Kentucky” for use as a tract in all families where the men folks tend to selfish or thoughtless or overbearing disregard of the rights of their womenkind.

Do not misunderstand me. I have not the slightest sympathy with those hysterical and foolish creatures who wish women to attain to easy lives by shirking their duties. I have as hearty a contempt for the woman who shirks her duty of bearing and rearing the children, of doing her full housewife’s work, as I have for the man who is an idler, who shirks his duty of earning a living for himself and for his household, or who is selfish or brutal toward his wife and children. *I believe in the happiness that comes from the performance of duty, not from the*

avoidance of duty. But I believe also in trying, each of us, as strength is given us, to bear one another's burdens; and this especially in our own homes. *No outside training, no coöperation, no Government aid or direction can take the place of a strong and upright character; of goodness of heart combined with clearness of head, and that strength and toughness of fiber necessary to wring success from a rough work-a-day world. Nothing outside of home can take the place of home. The school is an invaluable adjunct to the home, but it is a wretched substitute for it. The family relation is the most fundamental, the most important of all relations. No leader in church or state, in science or art or industry, however great his achievement, does work which compares in importance with that of the father and the mother, "who are the first of sovereigns and the most divine of priests."*

THE CULTIVATION OF THE PEANUT PLANT.¹

By RAMÓN GARCÍA OSÉS,

Director of the Río Verde Agricultural Experiment Station, Mexico.

Peanut growing is being steadily developed because the consumption of peanuts is increasing both at home and abroad. Exportation to foreign countries has already been initiated where peanuts are being used by confectioners for extracting the oil which is sold under the name of olive oil, being mixed with the latter to give it the appearance of olive oil and to get the better profit. The peanut is a very good fertilizer, because it has the power of accumulating nitrogen in the soil, due to a special kind of bacteria which live in the knots of its roots. Since the year 1865 peanut culture has developed considerably in the United States, which formerly imported great quantities of this crop from West Africa. Since that time the States of North Carolina, Tennessee, and Virginia have gradually increased their production, thus diminishing the quantity imported in spite of the increase in consumption.

ORIGIN.

As to the origin of the peanut plant (*Arachis hypogaea*), several American countries claim to be the place; for example Peru, where stringed peanut beans were found in the tombs of the primitive inhabitants. According to De Candolle Yañez Pinzon's companions in 1500, on their arrival in Brazil, found that the Brazilians were already cultivating it; in Mexico, according to Clavijero, the Spaniards found the natives cultivating it. Others believe it is of African origin and claim that it comes from lower Guinea and Senegambia; so that its origin is not well determined, and we can only state that the plant has been cultivated in the hot zones from time immemorial.

VARIETIES.

Up to the present there are few well-defined varieties of this plant. The characteristics of the fruit as well as of the leaves and its production and development in general may establish remarkable differences corresponding to the color and shape of the bean and small differences in

¹ Extracts from Boletín num. 1, Febrero de 1908, Estación Agrícola Experimental de Río Verde, San Luis Potosí, México.

the growing of the stem and the form of the leaf; but it is sure that henceforth, when its varieties have been studied thoroughly, it will be classified according to the quality and quantity of the fruit produced, the richness of fat contained in the bean, and the protein contained in the stems.

Virginia peanut.—This variety produces large beans covered with a white film; it has regular leaves of good flavor which keep for a long time; very leafy branches extend from the principal stem—those which grow upward being smaller than the lateral ones and much less numerous. In Cuba there is also a white variety, which is a native of Africa.

Clarmac yumbec.—This variety comes from Florida; both the leaves and the beans are larger than those of most other varieties. The film covering the bean is yellow or straw colored; the bean is much thicker and shorter, with thicker, smoother and more brilliant hull. In Mexico there are white and reddish varieties, the same as those cultivated in Tennessee.

Spanish variety.—In this class are the purple and white varieties. They are of good flavor and contain a large quantity of oil; they have small leafage, and for this reason they may be cultivated more closely. The fruit grows nearer the roots than those of the Virginia variety and it is harvested earlier.

African variety.—This is more precocious in growing and ripening; its beans are much smaller than the varieties already described; nevertheless, the seeds contain a larger quantity of oil. There are many other varieties in Costa Rica, Argentine Republic, Malay Archipelago, and British India, of which little is known.

Mr. Dumas, agent of cultivation for West Africa, describes the following varieties:

Lótiga.—This variety is characterized by numerous straight branches covered with leaves, 30 to 40 centimeters long, all of which grow toward the center.

Tigadia.—This kind has few creeping branches attaining a length of 50 to 60 centimeters; not so many beans grow near the center of the plant, but they are scattered in groups of from two to three along the branches. This plant gives but a small yield.

Sogobatiga.—This variety has very well-developed beans, from 3 to 4 centimeters long, which hang from two or three axils of the leaves.

Fila tiga.—This species has small beans but is nevertheless very productive.

USES.

The dry stems, beside being good food for live stock, are used in manufacturing paper; the beans are eaten either green or roasted; they are also used in the manufacture of candies; when ground and allowed

to thicken very palatable creams, puddings, etc., are prepared from them; when mixed with milk and rice exquisite sweets are made. Peanut oil, owing to its flavor and other good qualities, may be used as a substitute for lard; when the ground beans are dried and made into flour, mixed in equal parts with wheat flour, with yeast and salt added, bread and biscuits are made—a good palatable food that can be preserved for a long time.

The beans of the peanut when roasted and mixed with three parts of ground cacao beans makes a paste from which a chocolate is prepared that is said to be especially good for mothers. Both the beans and the residue after the oil has been extracted constitute a nourishing food for fowls, making their flesh tender and succulent so that it tastes much like the meat of the partridge. The residue which remains after the oil has been extracted is sometimes mixed with ground corn and makes a good food for fattening pigs, horses, and cattle. The ground pod of the peanut is a good absorbent and very easily absorbs molasses, making a palatable and nutritive food for animals. With the flour of the peanut and the cassava or "camoteng cahoy," mixed together in equal parts and well kneaded, a very palatable bread is made which when buttered makes an excellent food. Peanut oil may be easily kept for a long time without growing rancid. It is of a greenish yellow color, without odor and of a sweet flavor, but inferior to olive oil.

CHARACTERISTICS OF THE PLANT AND FRUIT.

This plant dries as the fruit ripens and has a period of growth of about six months. It belongs to the very useful family of the *Leguminosæ* and the subfamily of the *Papilionaceæ*; it is one of those plants the corolla of which looks very much like a butterfly; the Latin name of the plant is "*Arachis hipogea*"; the first word means branches and the second underground. In Argentine, Japan, Brazil, and France it is known as ground-nut or ground-bean.

The plant is herbaceous, annual, branching, a creeper, scattered, simple in its origin but branching afterwards. It scatters in every direction through the soil, growing usually about 50 centimeters high; its leaves are complete, composed of four oval leaflets arranged two by two; its flower is yellow. The fruit is a coriaceous vegetable, having constrictions or knots which show the location of the beans; having one, two and sometimes four oval-oblong seeds or beans, each one having two cotyledons. The first bean, which is oblong, ends in a point, the second and third are very irregular, and the fourth, when there is one, has a flattened, oblong head; they grow inside of the pod, more or less closely, taking these distinct forms. Each seed is covered with a thin, yellowish film protected by the pod, which has an exterior formed of irregular meshes of intercrossed threads like net; the embryo or the

young plant lies between the cotyledons in the extreme end of the seed. Supposing the bean is hanging from the plant and contains three seeds; the first, that on the higher part, has the embryo between this and the second, but inside of the cotyledons. The ends of the beans, which by growing closely become deformed, do not have the embryo because its germinating properties would suffer in this place. The special arrangement of the seed in this case is to be admired. Nature has arranged things in such a way that the embryo does not suffer from the deformity caused by the seeds being pressed together. The root is thin, it has the form of a fibrous bundle, and in the majority of cases many small knots of different sizes containing bacteria which provide the plant with nitrogen.

COMPOSITION OF THE PLANT AND FRUIT.

The bean has great nourishing value, constituting one of the principal foods of the natives of Senegal. As is shown by analysis it is classified among the dried fruits which are essentially nutritive. Not only are the beans advantageously used, but the stems and leaves of the plant constitute a good forage; it is also used as a fertilizer, which when applied to the soil not only returns what has been taken from it but furnishes it with nitrogenized constituents, which have been manufactured by the plant—thanks to the special bacteria which take in nitrogen from the atmosphere.

The mean composition of the different parts of the peanut is as follows:

Peanuts raised on the agricultural experiment station at Rio Verde.

Water	4.80
Ashes	2.70
Protein	26.19
Fibrous substances	3.81
Nitrate (in extract)	12.68
Fat	26.80
Organic matters	28.02

When the fruit is ripe.

Constituent.	Spanish peanut stems.	Georgia peanut stems.	Leaves.	Fruits.
Water	24.49	24.35	23.87	11.34
Ashes	8.75	9.70	9.04	2.97
Protein	9.13	7.45	8.09	6.32
Fibrous substances	18.28	26.21	24.16	19.00
Nitrates (in extract)	33.79	26.96	29.79	17.01
Fat	3.75	3.92	8.75	2.34
Organic matters	1.81	1.41	1.80	1.02

The following shows the immediate analysis of the bean, one made at the experiment station and the other by Mr. Moride:

	Experi- ment station.	Mr. Moride.
Water	4.80	2.70
Fat	26.80	35.44
Organic matters	65.80	59.86
Mineral matters or ashes	2.70	2.00
	100.10	100.00

It has been proven that the stems, even without leaves, are superior as a nourishing food to the stems and leaves of corn and many other forage plants, containing a large proportion of protein—being only a little inferior to red clover and alfalfa.

In regard to the fertilizing constituents which the peanut plant contains, the analyses show that its ashes contain large quantities of phosphoric acid and potash, as well as nitrogen, which elements are of most value as fertilizers. For this purpose the beans of the peanut are as rich as cotton seeds; the cake which is left after the oil has been extracted is very good for soils.

SEASON AND CLIMATE FOR PEANUT CULTURE.

The plant is better grown in hot climates than in the temperate zones, since in the former all of the beans of one and the same plant come out at the same time and take a shorter time for their development, being, of course, less susceptible to atmospheric changes, especially to drought or excessive rains. Excessive rains make the stem grow too high at the expense of the fruit.

It would be well for the plant to have, besides a hot temperature or climate, a relatively moist soil throughout its first period of growth and until the first blossoms appear, and then a gradually decreasing degree of moisture throughout the remaining periods. In temperate climates or when the buds come out in the cold season, the blossoms and buds make their appearance with a good deal of irregularity; those on the central part of the plant coming first, and their fruits ripen first; those on the branches near the center coming next; and lastly those at the greatest distance from the center where the blossoms will appear at the same time as the fruit on the central branches ripens. Its yield is greatest in dry but hot climates and in seasons without excessive moisture; otherwise, the leaves turn to a yellow color and dry up; and when the plant is laden with fruit the latter rots if unseasoned or sends forth suckers if ripe.

The quantity of oil in the bean seems to be less in proportion to the distance from the equator at which the plant is raised. If grown between 36° and $37\frac{1}{2}^{\circ}$ north in the United States it possesses a more delicious taste and a greater quantity of oily substance; but it must be remembered that though it grows well in temperate zones frost is greatly injurious to the crop. The largest plantations of this legume are found in the Guianas, between 2° and 8° north latitude, and in South America where peanuts are exported to France for the purpose of extracting the oil; the exports from these countries amount to thousands of tons yearly. However, as already stated, this crop grows well in a temperate climate; that is, in sections free from frost for six months of the year with no excess of rain at a later period. If this latter requirement is fulfilled it is not an absolute necessity that heat to a high degree should prevail, for the crop can accomplish all periods of its growth and fructification in a relatively cool temperature.

SOILS SUITABLE FOR PEANUT CULTURE.

The plant grows luxuriously and fructifies well in a hot climate in soils where corn can be raised to advantage. A soil with a humus layer, somewhat loose with not much sand and a little lime, but fresh and rich, may be used, but in this respect the peanut plant is very exacting. The soil must be rich and well proportioned in its components of sand, clay, lime, and humus, namely:

	Per cent.
Quartz	25-70
Clay	20-30
Lime	5-10
Organic matter	5-10

A most important condition is that the soil should be easily permeable; nothing is more injurious to the peanut plant and its fruit than excessive moisture resulting from the stagnation of a quantity of water on the surface or in the underground layer of the soil. For this kind of crop the soil should be well drained; no matter whether this be on account of geological or hydrological conditions, we have recommended it to lowland owners both in Río Verde and Ciudad Fernández.

While it is true that a proper watering of the soil is an essential factor to its productive power, and the main condition for all good farming in peanut cultivation, irrigation however, must be used in moderate degrees, especially during the first period of growth and the period of blossoming. Land devoted to this crop should, therefore, be such as to afford easy and prompt draining off of the abundant rains that come at certain seasons of the year. It is for the above reason that clayey soils, which retain water for a long time are not considered the best; for while the kernels thus produced might be of a fairly good size they will be produced in smaller quantity; besides that they would take on a dark-brown olive color which causes their depreciation in the market. From the foregoing it must be

apparent that the existence in due proportion of sand, clay, and lime in the soil is greatly advantageous to this crop, provided the ground does not offer any obstacle to easy drainage and to a good airing of the earth.

Peanuts raised on a light, sandy, and rich alluvial soil, besides possessing a delicious taste, contain also a larger quantity of oil. As to the plant, it grows luxuriously when timely rains visit the plantation, or where the land can be easily irrigated. In Cuba, where the plant is raised almost exclusively by the descendants of the African negroes, on the small parcels of land which they call "conucos," the growers select for this crop clayey, calcareous, and somewhat loose soil with a good humus layer slightly colored by oxide of iron.

MANURES SUITABLE FOR PEANUT CULTURE.

The kind of manure which is the most valuable for plants in general is that which contains phosphoric acid, potassium, and nitrogen. There are some crops like the peanut which require lime in addition. The proportion in which each of these elements enters the fertilizer and the question as to whether each should or should not be supplied will depend on whether the soil contains it or not, and in what quantity and quality the plant can assimilate it at the proper time, also that these elements be supplied in the necessary quantity and proportion to the quantity of the whole of the fertilizer required by the plant; that is, in such a proportion as is necessary for the best development of the plant and its fruit.

There is no better manure for a particular kind of plant than that which contains the elements entering into the composition of the plant and its fruit. For this reason, the residue of the plant itself is one of the best fertilizers, especially if some mineral principles have been added which may restore those that have been taken out by the fruit.

When a plant is consumed by fire the organic principles and the water contained therein go into the atmosphere with the smoke, and all of the other mineral principles remain in the ashes. Both constitute the components of the plant and we must know all of the component elements of the plant, as well as those of the soil in which the plant is to be raised. The best way to know these elements is to analyze the plant and the soil, and after comparison of the experiments made on the same plant with different kinds of manures, we may then arrive at a knowledge of the other elements needed by the plant from the soil. Without this knowledge we can proceed only in a tentative manner, which by reason of the cost of the manure and the bad results which often attend experiments come to be very expensive and greatly reduce the profit which otherwise could be obtained. Hence the necessity of experiment farms where such manures may be studied and conclusions arrived at from the comparative cultures made with the various crops.

Although calcareous soil is not the best for peanut cultivation, a quantity of lime, however, should be, as already stated, one of the elements entering into the composition of the soil, above all in that of the lowlands of Río Verde and Ciudad Fernández, at the same time manures containing some phosphate should be used.

It being a matter of fact that the custom of manuring the soil has made little progress with us, no matter what kind of crop is planted on the land, it will sound strange to most cultivators to say that the soil devoted to this crop should be manured, as no experienced cultivator would select a poor soil to plant on; so we lay down as an *a priori* fact, that must be a rich land which experienced cultivators consider to be "good for peanut culture." This goes to corroborate what has been said in speaking of the best kind of soils for peanut culture; that is to say, that the plant grows best on rich loamy land, and thus we do not wonder that cultivators both at Río Verde and Ciudad Fernández look for this kind of land. As such cultivators acquire a better knowledge of the requirements of the plant and of the kind of manure most suitable therefor, they will then apply to their land, if it is somewhat sandy or poor, the manure which may be required to supply thereto such principles as it does not possess.

The fact should not be lost sight of that this plant draws nitrogen from the atmosphere, which is then transformed into manure, finally being absorbed and converted into nourishment. It is for us a saving of a manure which is most expensive.

The formula per hectare which follows was attended with excellent results for the few plants cultivated:

	Kilograms.
Nitrate of soda	70
Superphosphate of lime	600
Sulphate of potassium	60
Sulphate of iron	100

Before this manure is used all of it should be reduced to powder, that it may thus be free from lumps which take a long time to crumble, otherwise small spots of soil contain too much manure, which would be of little advantage to the plant growing thereon. In the manure, furthermore, the various components should be well mixed, that they may be as uniformly distributed as possible and that every filament in the root system on absorbing those elements necessary for its development may find in the soil the proportion of each element needed. It is not convenient to mix lime with the soil either before or after having manured with the superphosphate of lime within a space of twenty days; but, as it is well that soil containing a small proportion of lime should receive some in addition, the lime should be applied to the soil when it is still fallow or at the time of the first plowing, that the manure may

be well distributed at the time of the second plowing, which should not be more than twenty days after the previous one has been completed.

As nitrate of soda has an immediate effect, it is better not to mix it with the other components of the formula until later on, a few days before the planting is done.

As peanuts are not always planted on the most suitable soil, because as already stated such soil is seldom found, they might come to be successfully cultivated on a soil rich in organic matter but rather sour. In this case, it is not convenient to use the superphosphate of the formula, as the latter would be injurious to the culture, in that the sourness of the soil would thereby be increased, but rather use a simple phosphate or phosphate of lime in its place (the main phosphates are those drawn from the earth, such as apatite, phosphorite, phosphated sand, and nodules of amorphous phosphate), and in this manner the acidity of the soil will be modified and the manuring done at the same time, thus making the nitrification easier, which never takes place in sour soils, and renders the manure more soluble.

PREPARATION OF THE LAND.

The statement has already been made that the plant requires considerable nourishment and therefore well-prepared soil to obtain the best results from the crop.

Before beginning field work it is well to know in what season the planting should be done. For this purpose we must know the period of vegetation of the plant and care should be taken that the ripening of the fruit will not take place during a rainy season or one in which rains prevail in the smallest degree. This of course is only in reference to the plant's last period of vegetation in regard to the other periods of its growth, it is well to know that frosts are injurious to the plant, and that for this reason the planting should be done during a season in which frost is least to be expected.

Taking into account that the plant completes all of its periods of vegetation in six months, we must so arrange matters as to bring the cultivation under the season which is most favorably adapted to this crop. Taking into account, too, that the plant grows well only in well-aired and moderately moist soil, the first of these conditions will then be fulfilled where the soil is well plowed and cultivated to the depth to which the extremities of the roots of the plant will reach. This cultivation of the soil is done to the end that the soil may receive the air which carries oxygen along with it, serving to promote such reactions as are beneficial to the earth. It also gives life to microbes in the soil which when well plowed and well cultivated becomes more porous and takes in a greater amount of air. That we may better grasp the idea, and account for the phenomena, let us consider that a soil, to be rendered porous, should

contain from 50 to 60 parts per thousand of air and water; air entering to an amount of not less than 40 to 45 parts per thousand, and water in the remaining proportion of from 10 to 25 parts per thousand, which is the degree of moisture a soil should contain for a regular nitrification. Rain water being such an important element for every kind of crop, advantage will be taken of the rain for the soil; and we should endeavor not to waste it, but allow it to be imbibed by the earth to the highest possible degree; for in passing through it always leaves behind most of those elements which it carries in solution, the most important of which is ammonia, as in it is contained the nitrogen so favorable to cultivation. On the other hand, the very same water which is stored in and absorbed by the plowed layer of the soil is less easily evaporated in the case of a loose and well-plowed soil. A piece of land the humus of which has not been plowed suffers evaporation to an extent of 80 parts per thousand of the water which it contains, while on a loose and well-plowed piece of land the loss is only 14 per thousand of the water under the same conditions. It is also to be noted that if a heavy shower of rain comes on a fully prepared and planted piece of land there might remain on the surface a quantity of stagnant water which would cause the plants, especially as the peanut is of a delicate character, to rot or be drowned.

Before the first plowing of a soil where some previous crop has been gathered it will be well to use a disk harrow of twelve steel disks, arranged in two sets of six disks, each of which turns around on a horizontal axle, the latter may be set straight or inclined toward each other by means of levers in order to better cut the grass and crumble the lumps, leaving a level even surface when the first plowing takes place. This machine will also work as a mold-crumblor on nonclayey soil.

The first plowing which should follow the work of the disk harrow must be shallow, that is to say, from 12 to 30 centimeters in depth; whether it must be more or less, within these limits, the nature of the humus will determine. In the case of a sandy or poor soil, it would perhaps be more convenient not to turn it up or to mix it with the humus. In soil containing a thick arable layer and in rich soil, such as this plant requires, we must carry the depth up to 30 centimeters, that we may always keep a good amount of moisture in the soil so that the roots and fruit may find space for their development, grow better, and produce in greater quantity.

In working the field, it is well to consider its shape, the disposition desired, and to have the ridges between the furrows well apportioned, taking care that they be made as long as possible, to avoid the making of many turns by the work cattle, and the waste of time by unnecessarily increasing the labor, as is generally done by our field hands.

Time for field work.—It is of the utmost importance to know beforehand the field on which it is intended to raise a peanut crop, that the soil may be prepared and the work begun in time so that the earth

may reach that condition of absorption and assimilation which is necessary to furnish the required nourishment for the plant. It is always well to start the work of plowing some time before the planting, allowing for time to remedy any difficulties which might arise from the failure to have the work completed at the proper season, such as an excess of moisture or the prevalence of a drought, thus not allowing the lumps of earth turned up by the plow to molder off. The soil must be prepared immediately after the previous crop has been gathered, in December, or if possible earlier in November.

Stages and kind of work.—As has been already stated, the first work to be done to any soil intended for the cultivation of peanuts should be to render it porous and even, doing away with any furrows or other unevennesses remaining from the previous crop. For this purpose the disk harrow or “crumbler,” to which reference has already been made, should be used.

As to how many times the work of plowing should be done, we need to be reminded that the custom of plowing only once should be discontinued, for in this way the soil is very poorly prepared. The results of this method are rendered manifest later in the scanty yield and the greater expense incurred by the larger amount of weeding which the grower has to do if the work on his plantation is well attended.

After the work with the disk harrow or “crumbler,” the first plowing should be done with a disk, or other middle-sized plow, such, for instance, as No. 20 Avery, or Curimeo H. D., which go into the earth turning it up at least 12 centimeters deep. The soil should then be left undisturbed for twenty days before using the spiked harrow for breaking lumps and turning the soil into an even, porous, and well-aired condition. After this second plowing and a space of time has elapsed equal to that above-mentioned, a second harrowing should take place. Ten days later, another plowing should be done, if possible crossways to the previous one. The soil is now prepared to receive the seed, and it remains only to await favorable weather for planting. If the opportunity fails to present itself at an early date, and it rains in the meantime, it is very possible that some weeds will make their appearance; in this case it is necessary to use the spiked harrow again before the ground is furrowed for planting; otherwise, weeds will appear in quantities around the growing peanut plants checking their further growth and development.

SELECTION AND PREPARATION OF SEED.

The first condition to be complied with by an intelligent and enterprising cultivator is that of selecting his seed from plants which are known to have attained the largest development and have yielded the greatest amount of fruit. It is a general law applicable to every living thing that, as the parents are so are the children, and with this maxim

in mind, a good selection of seed comes as a necessary condition for the improvement of the product, and increasing the crop yield without great labor, difficulty, or expense.

As to the seed, the large-sized grains or beans should be selected, for the reason that the new plant, during its first period of growth, has no other food than the nutritive elements stored up in the seed, and on these the embryo of the peanut depends for its ultimate growth into a strong and highly productive plant. Every grain of seed which is not well ripened, or if shrunken or musty, or in case the thin membrane which envelopes it is not perfectly sound, should be rejected. The pods intended for seed should be long exposed to the sun in a dry place. Beside what has been said about selecting seed from plants which have attained the largest growth and have yielded the greatest number of pods, those strings should be selected which contain the greatest number of pods and the best shaped beans. One of the advantages of this latter selection is that the fruit ripens with greater regularity.

If the importance of fulfilling the above conditions has been well understood, we shall then endeavor to use as seed the fruit of those plants which ripened earliest in the season; for as a rule there are great advantages attached to this fact in every kind of crop, for example, the danger while the crop is exposed on the field from rain rotting the fruit if it is unseasoned, or causing germination if it is ripe.

Some people believe that the seed should be changed; that is to say, that the fruit once gathered from a particular field should not be used again for seed on the same field. They claim that by so doing the product becomes wild and degenerates. This, besides being questionable, will be found to increase the difficulty of acclimatation and adaptability of the seed to soils with different properties and different composition. What may have the greatest influence in causing this so-called degeneration of the product is the little care most growers use in selecting a seed which may possess all of the qualities hereinbefore enumerated. If any of such growers come to use the kind which fulfills the requirements of a good seed, they will then probably keep for themselves, and not for others, a kind of seed thus conditioned. I therefore feel inclined to recommend that as far as possible the fruit obtained on a particular plantation be used again as seed for the same plantation. This, of course, does not mean that if a better variety of the product be found to grow well on some different spot, the seed of the latter may not be used instead of the one which has been previously raised on the same spot.

In taking the bean out of the pod care should be taken not to break the membrane which envelops the bean, nor to break or crush the latter, which would result in damage to the embryo which is found at one end of the bean.

In order to hasten and secure better germination and proper nourishment of the plant, the seed should be put into some liquid which will not

only furnish moisture but also some nourishment to it. The soaking is done to bring out the nourishing substances which may aid the seed during the first period of its growth.

PLANTING.

As already stated, above all other conditions that of ripening the fruit during the dry season should be fulfilled. This season comes with us in Mexico wholly in October and we may have a good harvest if the planting was done six months before that date; that is, about the month of March or the earlier part of April. In different localities or countries the planting period comes at different seasons according to the time of the rainy season therein. In Cuba or Porto Rico the planting season is between April and May, in Cochin China and Spain in May and June, on the Guinea coast toward the end of June and throughout July, and in India in July and August.

From experiments made last year, the distance between plants which was attended with the best results was that of 80 centimeters from furrow to furrow, putting two grains together in the furrow at a distance of 60 centimeters. In the case of a rich soil, the furrows may be made 1 meter apart and the beans may be put two in a hill at the greatest distance of 80 centimeters; although a plant may fill a space of 1.20 meters or even more, it matters little whether the larger branches overlap each other, because the fruit itself grows at a very short distance from the stalk. With a small-sized plow the furrow is made. The seed is then dropped and another plow of equal size, which comes after the previous one, covers the seed with earth. After the planting has been done a harrow is used on the planted field to make it even and level, not only that harmful animals may find it more difficult to get at the seed, but that all subsequent work may be made easier.

VEGETATION AND CULTIVATION.

Six days after the peanuts have been planted the little leaves of the first shoots may be seen, this takes more or less time according to the climate. In Spain it takes from fifteen to twenty days, and the lower the mean temperature the longer it will take for the shoots to appear. At the end of one month the shoots are all put forth, and the plants have attained such a height as will render them capable of advantageously standing a first weeding. When the furrows have been made at a distance of 80 centimeters from each other the weeding can be done with a cultivator, taking care that the shovels do not touch the stalks of the plants. Immediately after the cultivator has been used laborers with hoes should go into the field clearing away all weeds and stirring up the earth around every plant.

A few days after the weeding, the first irrigating should take place, provided the soil is still pretty dry and the plants have not put forth

their branches. The work of irrigation should be continued in proportion as the dryness of the earth requires.

The first sterile blossoms will appear on the peanut plant one month after the shoots are put forth; two months later, keeping company with the growing branches, the fruit blossoms begin to appear at the leaf axils. The blossoms hang from a stalk which stretches out, reaches the ground and goes into the soil as an adventitious root. During this stage of growth of the plant it is well to have some slight irrigating work done to aid in the vegetation and the blossoming of the plant. This accounts for the fact that on light soil and soil deprived of water supply, the yield is small; this is on account of the withering of the plants. While blossoming is going on, it is well to cut off the ends of the principal branches that the sap may employ itself more fully in the shaping and development of the fruit and in imparting greater vigor to the blossoms and the beans.

If at this state the plantation is found to contain an excessive amount of weeds, a hand-to-hand weeding should take place, care being taken not to root up the branches and especially not to touch the stalks or filaments hanging down from the leaf axils.

DISEASES AND ENEMIES.

Sometimes the discovery is made of a plant beginning to assume a slight yellow color which, if not taken care of in time, will extend to the whole plantation. This comes to pass as a consequence of stagnant water, which by lack of proper drainage has remained in the field; it sometimes lies in the underground layer and does not appear on the surface of the soil. If the work of draining off the soil is taken up at once the evil may to a large extent be remedied, but if it is allowed to go on unchecked all the plants will rot, beginning, as stated before, by their first becoming yellow and then withering away altogether.

Among the enemies of this crop are to be counted rats, squirrels, monkeys, also quails and partridges. About the time germination begins in the seed the latter two scratch the earth and dig out the seed and destroy it. Quails are the more destructive of the two, for they are the more voracious and possess a greater scratching power. They not only begin their ravages at the first period of the growing seed but also at the early part of the fruiting season when they scratch all around the plants and eat the kernels or beans. For the destruction of these birds traps and poison-infected peanut grains are laid. This crop is one to which locusts can do but little harm.

HARVESTING AND DRYING.

When the leaves become yellow and dry we may conclude that the bean and pod have reached their full growth and are already ripe, the plant no longer affording nourishment thereto, the time for the harvest is at

hand. When there is no danger of rain, and there exists no pressing need for harvesting, the crop may be left on the field some weeks more before the appearance of the above symptoms, allowing the branches and the pods to dry up.

If the soil is loose, the first days may be devoted to carefully uprooting and heaping up the plants, which will be found to have some strings adhering to them that will drop off later. If the harvesting takes place in the early days after the ripening of the fruit there will be the advantage of a greater quantity of food going to the cattle, for the leaves do not all drop off and decay as in other crops, but keep a certain degree of freshness for a longer time, thus affording greater nourishment as a forage food. In order to clear the soil and at the same time to render the task of harvesting easier, the branches should be cut off from the roots and strings. This can best be done by grasping the branches with the left hand, lifting them up to a point when the trunk comes into view and then chopping them off with a cutlass. In this way the harvester walks in front piling up all of the branches to the left, carrying on his work in a space of from 2 to 3 yards wide. The branches are allowed to dry outside the field and later stored and used for forage.

When the soil is cleared, the peanuts may be dug with a plow, similar to that used for digging potatoes, which crumps the earth and turns it up; men, women, and boys come behind and pick up those strings and pods brought to the surface by the plow and put them into baskets; they then separate the earth with both hands, to pick out such other pods as can be discovered until no more pods can be found in the hills. While the team is plowing the number of laborers should be apportioned by sections so that the work of every section will be finished within the space of time necessary for the plowman to come back and make a new furrow. This work is done by contract, quantities of 48 to 50 liters being delivered into the hands of the employer for 25 centavos.

The employer should have the drying place in readiness for the crop to be emptied and exposed to the sun. The drying place should be prepared on that portion of the field where the earlier harvesting took place. Such a tract or space as may be required for the operation should be leveled, then parallel strips of soil 1.20 or 1.30 meters wide marked out. Between every two of these strips a ditch of appropriate depth and width, enough for two persons to come abreast without hindering one another, is excavated. With the earth dug out of these ditches the strips are built up and made level, and on these the peanuts are spread out to dry in layers not exceeding 2 centimeters in thickness. In this way the peanuts are left exposed to the sun; but they should be shoveled over and over every day that they may be made uniformly dry; with this shoveling also whatever residue of earth the fruit retained will be shaken off.

MARKETING THE PRODUCT.

As the drying is going on, the quantity of the product may be ascertained by measuring it in hectoliters which weigh from 29 to 30 kilos each, after which they should be sacked up for market.

We have obtained as high as 78 hectoliters and 43 liters per hectare, or a total yield of 132 hectoliters of peanuts was harvested from 16,830 square meters of land; the weight was 29 kilos a hectoliter and the aggregate came to 3,828 kilos, or a yield of 2,274.5 kilos per hectare.

The seed used was as follows:

	Per cent.
Of only one grain in the pod.....	75
Of two grains	6½
Straw and earth	18½
	<hr/> 100

The seed harvested as follows:

	Per cent.
Of only one grain	71
Of two grains	7½
Straw and earth	21½
	<hr/> 100

One hectoliter weighing 29 kilos contains—

	Kilos.
Beans	22.76
Straw and earth	6.24

The amount of oily substance is 26.8 per cent, hence the oily substance in 1 hectoliter amounts to 6 kilos and 0.099 gram.

COST OF THE PRODUCT.

Preparing the soil	\$16.20
6 hectoliters of seed (not very good).....	32.04
Preparing the seed	3.65
Planting	20.42
First weeding	10.75
Second weeding	5.41
Irrigation work	3.45
Cutting off the branches	5.58
Harvesting	85.32
Rent on 16,830 sq. m. of land	27.22
Interest on investment for 6 months.....	9.45
Total	<hr/> 219.49

RECEIPTS FROM THE CROP.

132 hectoliters of peanuts, at \$4.50 per hectoliter.....	\$594.00
The forage estimated at	25.00
Total	<hr/> 619.00
Cost of production	219.49
Net profit	<hr/> 399.51

CONCLUSIONS.

As may be seen from the above data, peanuts are one of the best paying crops in our Republic; but it is difficult to find agricultural machinery adapted to harvesting them, unless the potato digger be considered such. It requires, too, a good deal of labor, a number of harvestmen, and the profit is good only where the wage standard is low. On the other hand, its culture can not be carried on over extensive fields or on a large scale because of the great number of hands required and the length of time the work of harvesting takes. Finally, the peremptory and pressing need of laborers for timely harvesting draws some bad characters into the fields, and unsettles the other work of the growers, for the latter have to put off in whole or in part all other kinds of work that they may devote the necessary time and attention to this crop.

THE CULTIVATION OF THEOBROMA CACAO OR COCOA.

(Continued.)

By A. FAUCHÈRE,

Assistant Inspector of Agriculture in Madagascar.

THE ESTABLISHMENT OF THE PLANTATION.

A plantation may be started in two ways—by planting the seeds directly or by using plants already started in a nursery. Each of these methods has its partisans and its adversaries. It seems to me that these differences in opinion are due to the different conditions under which the observations were made. Thus, Guérin, in his work, “Culture du Cacao á la Guadeloupe,” utterly condemns the using of nursery stock, while the planters of Surinam and Madagascar usually plant trees that have been six or eight months in a nursery.

It is very evident that in the cacao lands in Guadeloupe, usually formed of decomposed volcanic rock, it would be impossible to raise the plants with balls of earth about their roots, and consequently the transplanting might be very harmful. This difficulty is not encountered when the soil is heavy. The young trees can be balled easily and do not suffer at all in transplanting. Furthermore, Guérin is quite wrong in saying that the taproot is the essential part of the cacao, and that the least injury to it results in the death of the tree. In Trinidad, when transplanting is done on the plantations, the ends of the taproots of the nursery trees are cut off, and they do not suffer in the least.

Studies made at the Ivoloina experiment station by my colleague, Mr. Deslandes, have proved that the cacao tree, like most other vegetable species, undergoes transplanting and shortening of the taproot without any bad results. Be that as it may, planting directly by seeds is the method most employed. In Surinam both methods are used, but this one is used exclusively in Trinidad, Venezuela, Ecuador, Brazil, and all the countries in which cacao planting is done on a large scale.

In Madagascar, so far, nursery trees are planted, but it is probable that seed planting will be done in the future, even though the results of attempts in this line at the Tamatave experiment station have not yet been satisfactory. In the valley of Mangoro, however, there is a small plantation that was started from seeds.

Planting by seed.—Planting the seed directly, or as it is often called, "at stake," has, like planting nursery stock, advantages and disadvantages. By sowing the seed at stake, time is saved and the plantation can be established more quickly. It is probably this fact that has led to the adoption of this method in all the countries where cacao culture is carried on to a large extent, and where manual labor is scarce. Less skill is required on the part of the laborers to sow the seeds directly in the spot in which the cacao trees are to remain than to take the young plants from the nursery and transplant them to a more or less distant place without breaking the cube of earth that protects their roots.

It is necessary to keep close watch just after the seeds are planted to defend the young trees against adventitious plants, which ordinarily grow with great rapidity. Insects may also cause damage by eating the plantlets at the time of germination.

Starting the plants in a nursery has the advantage, as was said above, of allowing the planter to make a careful selection, and plant only the well-formed and most vigorous specimens. Besides, while the trees are starting in the nursery—a period of from four to ten months and possibly longer—it is not necessary to cultivate the land. Trained workmen are required, however, for setting out the young plants. It is a slow process, and not the method usually employed in countries where cacao plantations are laid out on a large scale. But since both methods of installing a plantation are in use, I shall describe each one. Whichever method may be used, a nursery is indispensable, for in plantations started from the seed, replacing is always necessary.

Choice of seed.—If in the country where the plantation is to be started there are a number of well-known varieties of cacao, of which the needs are also known, the first thing to be done is to choose the variety that will furnish a product of high commercial value, and at the same time be best suited to the conditions in which it is placed. In Madagascar this question of choice does not arise as yet, for up to the present, except for the kinds introduced by the department of agriculture, which have not yet borne fruit, there is but a single variety in existence.

Choosing the seed-bearing trees is quite a different matter. These must be selected with extreme care; in fact it is the only way by which the yield can be improved. For this reason fruit for this purpose must never be taken from trees that are not prolific and healthy, and the fruits themselves must be well selected, the small or imperfect ones being thrown out. They must be picked as soon as they are thoroughly ripe, and as short a time as possible before planting.

If for any reason it is necessary to delay the sowing for some little time, or to send the seeds away, it is a good plan to open the fruit pods as soon as possible after picking, remove the seeds and place them in layers, alternately with layers of sand or mold, in a packing case if they are to be shipped, or in a pile if they are to be planted near where

they were picked. If the distance is not too great, it is better to keep the fruits intact until the seeds are placed in the ground; however, in this case it is necessary to use the seeds very soon, or fermentation will begin within the fruits and a number of seeds be rendered worthless.

When the planting is about to be done the fruits are broken and the seeds taken out. Imperfect seeds and those near the ends are rejected. In Madagascar it is reckoned that one fruit will provide not more than 25 seeds. From this it is easy to calculate in a general way the number of fruits needed, if four seeds are placed in each hole. The seeds being removed from the fruit the watery pulp that surrounds them is next washed off. The planters of Surinam and Trinidad do not do this as a rule. They roll the seeds in lime or ashes and then dip them in citron juice, to protect them from the bites of insects.

If the hole has not been made in which the cacao is to be planted, it will be necessary to clear away the brush to a radius of 2 to 2.5 meters about the picket marking the place. The top of the soil is then broken over a surface 50 to 60 centimeters in diameter, the stake marking the center. Then the seeds are placed in this space about 25 to 30 centimeters apart, at the corners of a triangle if three are planted, or at the corners of a square if four.

The seeds should be sown at a depth of from 2.5 to 3 centimeters, and the soil spread over them lightly. In Trinidad, where it is not the custom to dig holes, the method I have just described is followed, and the laborer plants usually "by the job," from 70 to 100 pickets, according to the condition of the brush. The clearing around these pickets and the breaking of the ground are of course included.

It is necessary to go over the ground frequently after the seeds are planted, to make sure that the weeds do not overrun the place. In Dutch Guiana the ground about the young cacaos is cleared thirteen or fourteen times a year. In Trinidad, where it is dryer, six or eight times seems to be sufficient. When the plants have attained a height of 20 to 25 centimeters, it is well to take out two or three, according to whether three or four seeds have been planted. The strongest plant is left, of course, and the others are used for replacing, where that is necessary. In some places the planters do not proceed in this manner. In Ecuador, for instance, it is the custom to leave two, three, four, and even more plants growing together. In the cacao plantations of Bahia, in Brazil, four plants are usually left.

The proprietor of large cacao plantations in Belmont, Bahia, explained to me that he believes this method is beneficial to the fruiting, because the four trunks tend, in growing, to move away from one another, and incline more and more as they become larger. The flowers which grow on the outer side of the trunks are thus sheltered from the rain, which would appear to make their development into fruit more certain. I give

this opinion for what it is worth, but must add that I have seen a great many cacaos growing alone and very erect, whose trunks bear fruit in an entirely satisfactory manner.

The method of allowing several plants to grow together is out of place in regularly laid out plantations, where, I believe, the trees should be as regular as possible in form. However, since this method is employed in regions where cacao culture extends over immense areas, and since I have not had an opportunity to study its advantages or disadvantages, I am not in a position to either condemn or advise it. It is probable, nevertheless, that it is a method that can be successfully applied only where the land is particularly fertile.

Time for sowing.—The time for sowing is necessarily determined by the times for the principal harvests, which occur in most of the countries twice a year. When the climate is very warm and the country situated near the equator, it is possible usually to plant at the time of one or the other harvest. When, on the contrary, the northern or southern limit of the zone for cacao culture is approached, it seems preferable to not sow until the time of the harvest nearest to the winter season, or, on the other hand, the harvest nearest the warm season. Observations made at the Ivoloïna station have confirmed this opinion.

In Madagascar cacao is harvested first in June and July, and again in October and November. It is at this latter time that the planters usually plant the seeds, either at stake or in nurseries.

In June and July the temperature is too low, and the plants growing from seeds planted at this time develop slowly and are puny. In the event of planting the seeds in November it would seem best to plant the bananas in April or May. In Madagascar this time would probably be the best, for in Trinidad the planters prefer to set out the *Musa* during the cold season.

Sowing in the nursery.—If it is desired to establish a plantation with plants already started, a nursery is evidently needed, but even when started directly from the seed, it is necessary to have a small nursery containing plants for replacing those which are not healthy, or seeds which have not germinated.

Choice of the situation of the nursery.—If a large plantation is being established, one nursery will not be sufficient, but several should be located at regular distances over the plantation, to reduce as much as possible the distance that the plants will have to be transported, as well as the expense incurred in thus transporting them. In Trinidad, for example, a nursery is installed for every area of about 10 hectares.

The site upon which the nursery is to be placed should have as rich soil as possible; and it is equally necessary that the soil should be heavy enough to permit easy balling of the roots when the plants are moved. Shelter from the wind is a third indispensable condition.

In order to procure for the young cacao the shade they demand, it is not desirable to plant them under the shade of larger trees whose roots usually monopolize the soil to too great an extent. I have seen certain Dutch planters in Surinam sow the cacao seeds even in the midst of the cacao on a plantation. The plants that resulted were usually so puny and of such slow growth that this would seem to be a serious mistake.

Preparation of the soil.—The site having been chosen, it must be plowed to a depth of 25 or 30 centimeters, working in by this means the amount of manure, ashes, and mold that is considered desirable, and the stones and roots that are in the way can be removed.

After having thus plowed and leveled the surface, beds are laid out, about 1.2 meters square, separated by paths 50 centimeters wide, so that the coming and going necessary in weeding and watering the plants will be rendered as easy as possible. The beds are then leveled and the clods broken, after which six furrows 20 centimeters apart and 20 to 25 centimeters deep are made in each bed. The seeds, having been prepared as described under "Planting by seed," are placed at the bottom of these furrows at intervals of about 20 to 25 centimeters, care being taken to lay them with the flat side down. The surface of the bed is again leveled, covering the seeds lightly. Whether the surface is left bare, or is covered with a light layer of mold or sand to prevent it from baking, depends on the location. Sand has proven very satisfactory at the Ivoloina experiment station. In Trinidad, immediately after sowing, the ground is covered with banana leaves which are removed after germination begins.

Immediately after the sowing, if it has not been done before, shelters of some sort must be erected over the nursery. At the Tamatave station the shelters are about 1.8 meters above the ground. These provide the necessary shade without preventing the free circulation of air, and are high enough so that the laborers can work underneath.

Solid pickets about 2 meters long are planted in regular lines through the beds. Their tops are connected by sticks about 4 meters long which support a network of smaller sticks, stalks of raffia, or small palm leaves. Over the whole are firmly attached branches of heath, found commonly along the shore. They are fortunate in having at Ivoloina plants which furnish sufficient and well-regulated shade. These shelters may be accused of being too costly, but in an experiment station permanent frames are necessary, because the same place is used year after year for new crops, and so far nothing more practical has been found.

The planter who has no use for such durable shelters may follow the planters of Surinam who lay palm leaves over frames that are about 1.5 meters from the ground and supported on solid poles. In Dutch Guiana I have seen this method followed with very satisfactory results.

The leaves being simply laid over the frames without being attached in any way, the intensity of shade may be varied as it is found desirable.

Ordinarily in the plantations I have visited the young cacaos are not pricked, but this method has been put into practice at the Ivoloïna station, where it has proved a success, the remaining plants undergoing balling and transplanting more easily. Pricking does not appear to be indispensable, and it would seem that people who are desirous of planting large areas with nursery plants could well dispense with it.

In Trinidad the nurseries for replacing trees are made in a very different manner. If the plantation is not a new one, and the shade trees are mature, spots in which the soil is very compact and which are not covered with heavy brush are chosen under the shelter of these trees. The ground is cleared of weeds, but not plowed. Furrows 2 or 3 centimeters deep and 25 to 30 centimeters apart are made, and the seeds deposited in these furrows. The soil is then replaced and smoothed down, and banana leaves are laid above, which remain usually eight or ten days, or until the seeds begin to germinate, after which they are removed. Evidently this very simple method of establishing a nursery can be employed only where the cacao grows with extreme facility, and would be attended in such a place as Madagascar, for instance, with difficulty.

After the germination it is necessary to keep the soil clean by constant weeding. In the heavy lands of Surinam the surface of the beds is stirred up by means of little pointed sticks two or three times during the five or six months that the plants remain in the nurseries. This operation, which provides a free circulation of air in the soil, is a good one and should not be neglected. If the season is too dry it will be well to irrigate, or cover with straw, if need arises.

The length of time that the young cacaos remain in the nurseries varies according to the region. At Jagtlust (Surinam), where all the plantations are made by means of trees started in well-kept nurseries, setting out takes place four or five months after sowing. In Madagascar, from observations made at the Ivoloïna experiment station, it is well to leave the plants in the nursery at least a year. In Trinidad the plants are set out eighteen months after sowing the seed. It is the opinion there that they should not be set out until they begin to form branches. I have seen trees nearly three years old transplanted with very good results.

The best time for setting out the young plants is certainly the warm and rainy season, but in countries where it rains practically the whole year it is possible to plant at any time, though it is preferable to wait until the vegetation takes a new start. In Tamatave setting out may be done from December to March, though December and January are the best months, so that the young plants may be well started and will not suffer so much during the cool season. The plants should be raised very carefully with as large balls of earth as possible. If they are transported

any great distance, it will be prudent and even necessary to cover the balls with banana leaves or green herbs to prevent breaking. On the contrary, if they are set out near the nursery it will suffice to place them carefully side by side in a case in which they can be carried to the location desired, and set in place at once by the plantation laborers.

It is not wise to take up a large number of nursery plants in advance, and those that are taken up should be protected from strong sunshine. If the planter is compelled to set out his trees during dry and sunny weather the process should be discontinued during the heat of the day. Neither in Dutch Guiana nor in Trinidad do they strip the leaves from the plants. But if the weather is at all dry they cut off part of the leaves in order to diminish evaporation.

In certain mountainous plantations in Trinidad I have seen the taproot cut off with a knife where it projected beyond the ball; and in other plantations situated on the lowlands, on the contrary, the taproot is preserved in its entirety and placed carefully in the hole that is made especially deep for this purpose. When I asked the manager of the plantation the reason for this he said that in the Arinao districts the cacaos were very much exposed to the winds, and the plants whose taproots had been broken off at the time of planting offered less resistance to the wind than those on which the taproots had been carefully preserved.

In setting out, the plants should be placed deep enough so that the top of the ball will be covered with soil to a depth of 3 or 4 centimeters. If a dry period follows the setting out it will be necessary to irrigate the plants whose balls have been broken. This precaution should not be neglected if regularity of the plantation is to be maintained from the outset. I know that planters in the great cacao-growing regions will smile if they read this, but I am writing it for the benefit of the planters in Madagascar where the climate is such as to make necessary precautions that would be superfluous elsewhere.

There is one method of preparing the plants that I have not mentioned, that which consists in sowing the seeds in baskets, pots, or better in bamboos of a certain diameter. It is everywhere employed in government establishments whose mission it is to furnish plants to individuals. The method must have its advantages since it is used, but it has also numerous disadvantages, which would prevent its regular use by those who plant upon a large scale.

AGRICULTURAL NOTES.

Weather conditions.—The drought is pretty general all over the Islands with more or less severity in some regions. Considerable damage is reported as having been done to crops in the towns of Santa Barbara in Pangasinan, Bangui in Ilocos Norte, Lobos and Sevilla in Bohol, Buhi in Ambos Camarines, Butuan in Agusan, and some districts of Batangas, Samar, Sorsogon, Capiz, Negros, Tayabas, Tarlac, and Cebu. There are, however, numerous exceptions to this condition and crops are reported as looking particularly fine in San Simon, Porak, San Luis, and Candaba in Pampanga, La Paz and Capas in Tarlac, Laoag in Ilocos Norte, also Cabadbaran in Agusan, Mambulao and Nabua in Ambos Camarines, Laua-an in Antique, Lipa in Batangas, Dimiao in Bohol, Maragondon in Cavite, San Francisco and Sibonga in Cebu, San Nicolas, San Fabian, Santa Maria, and Calasiao in Pangasinan, Binañgonan and Antipolo in Rizal, Sorsogon, Castilla, and Magallanes in Sorsogon, Dapa and Gigaquit in Surigao, and Tarlac, Bamban, and Pura in Tarlac.

After about the first of May rains were rather abundant in some provinces and in a few cases did a little damage to fields of rice, tobacco, and corn. The towns reporting this condition were Talisay in Ambos Camarines, Daet in Ilocos Sur, Malabon in Rizal, and Passi in Iloilo. Strong winds have also contributed to the damage done to crops still standing in the fields.

Enemies of agriculture.—Mice continue to do considerable damage in the rice fields, and in some districts of Albay, Samar, and La Laguna they have even attacked the crops of corn and sugar cane. Notwithstanding this, however, these crops seem to have a good prospect.

In Occidental Negros locusts and grasshoppers continue to do considerable damage to the fields of sugar cane. Such reports have been received from the towns of Manapla and Talisay. Swarms of locusts have also made their appearance in Bohol and done considerable damage to the crops in Sevilla, Sierra-Bullones, Loon, and Bilar. In spite of this fact, the harvests gathered in these places were not less than those of Kabancalan, San Carlos, and other towns of the province.

Harvests.—Rice from the second harvest has been collected in some towns, for example in Paombong and Hagonoy in Bulacan, Masantol in Tarlac, Gapan in Nueva Ecija, and some of these have reported large harvests. The crops of sugar cane, corn, hemp, and coconuts have also been reported as very satisfactory in the Provinces of Agusan, Ambos Camarines, Antique, Batangas, Bohol, Cavite, Cebu, Pangasinan, Rizal, Sorsogon, and Tarlac. The rice fields in La Laguna have been reported

as in excellent condition and it is expected that a large harvest will be gathered; in fact, much larger than for several years past. The price of hemp is very low, so low that our correspondent in Cabadbaran, Agusan, states that he offered all the hemp he had to anyone who cared to remove the fiber and no one appeared. Other cases like this have been mentioned in recent reports; the price continues so low that hemp growers are thoroughly discouraged.

Animals diseases.—Animal diseases continue in some districts, but comparatively few deaths have been reported. Those reported are from Patnongon and San Remigio in Antique, Porak in Pampanga, Santa Maria in Bulacan, Rosario in Batangas, and a few other towns. Attention has often been called to the fact that the existence of animal diseases in some sections is due to negligence of the authorities and the cattle owners. The municipal health officer in a town in Leyte asserted that certain animal diseases prevailed in his district but that it was not his business to stop them. It is hoped that all public officials as well as the owners of cattle will carefully study and follow the precautions which have been laid down by this Bureau to avoid the spreading of diseases which take away so many of the work animals of the farmers.

Correspondence.—A correspondent from Santa Cruz, La Laguna, makes inquiry regarding machinery for the husking of coconuts and a better means than that which is commonly used in the Philippines for drying the meat. It is understood that very satisfactory machinery for husking coconuts is being used in Ceylon and other coconut-growing countries, and that satisfactory ovens for drying copra are now in use; the editor will endeavor to obtain cuts or photos and descriptions of such machinery and apparatus as soon as possible.

Another correspondent from Baganga, Mindanao, writes encouragingly of conditions in that town. He states that it is situated in a section which is advantageous for the improvement of agriculture. Rain is reported as being very abundant and frequent from December to April; in fact, there is rarely a month in the year when there is not enough water for the favorable growth of any kind of crop.

The principal crop of the place is abaca which could be of first quality if the natives would only take some pains in stripping and cleaning. During the past year there has been gathered in all some 4,000 piculs and but for the lack of farm laborers much more could have been harvested. During the present year there has been quite a number of additions to the coconut, abaca, and rubber plantations. Four Americans have settled in Baganga with the intention of devoting their time to the improvement and development of agriculture. Baganga is said to be very free from contagious diseases and only a few cases of fever or grip are reported. Fortunately, the live-stock disease known as rinderpest is unknown. The roads are being gradually improved and the writer states that the town has good harbors, one situated on the north and the other on the east, so that steamers can come in at any time of the year.

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM MONTHLY CROP REPORTS FOR THE MONTH OF MARCH, 1909.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state.]

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Agusan (reports from 3 municipalities):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Good	40	160	2,400	Cavans.
Abaca	do	11	15	400	Piculs.
Coconuts	do				
Tobacco	do				
Albay (reports from 13 municipalities):					
Rice	do	15	6,233	166,960	Cavans.
Abaca	do	70	5,590	11,351	Piculs.
Corn	do	178	48	15,431	Cavans.
Coconuts	do			691,200	Nuts.
Ambos Camarines (reports from 27 municipalities):					
Corn	do	111	29	229	Cavans.
Rice	do	14	4,053	60,047	Do.
Abaca	do	270	4,360	15,431	Piculs.
Coconuts	do			1,114,000	Nuts.
Antique (reports from 9 municipalities):					
Sugar cane	do	573	511	14,840	Piculs.
Coconuts	do			9,000	Nuts.
Tobacco	do				
Corn	do	61			
Bataan (reports from 7 municipalities):					
Rice	Fair	35	325	13,000	Cavans.
Sugar cane	Good	4			
Corn	Fair	3	4	10	Do.
Coconuts	do				
Batangas (reports from 12 municipalities):					
Sugar cane	Good	2,285	1,621	34,950	Piculs.
Corn	Fair	107	1,570	1,336	Cavans.
Abaca	do		42	97	Piculs.
Tobacco	do		20	40	Quintals.
Benguet (reports from 10 municipalities):					
Rice	do	44			
Sugar cane	do	315			
Corn	do	11			
Coffee	do	418			
Bohol (reports from 21 municipalities):					
Coconuts	Good			1,244,000	Nuts.
Corn	do	2,008	262	4,118	Cavans.
Rice	Fair		1,857	18,460	Do.
Abaca	do		77	289	Piculs.
Bulacan (reports from 15 municipalities):					
Sugar cane	Good	1,527	1,731	7,954	Do.
Tobacco	do		81	500	Quintals.
Corn	Fair	416	49	620	Cavans.
Rice	Excellent		17,080	694,770	Do.
Cagayan (reports from 13 municipalities):					
Rice	Good		570	10,550	Do.
Sugar cane	do	8			
Corn	do	383	45	950	Do.
Tobacco	do	328	10	100	Quintals.

Crops planted and harvested and condition of same taken from monthly crop reporters for the month of March, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Capiz (reports from 22 municipalities):		<i>Hectares.</i>	<i>Hectares.</i>		
Abaca	Fair	23	102	572	Piculs.
Coconuts	do			177,000	Nuts.
Corn	Good	77	73	440	Cavans.
Sugar cane	do	23	87	2,886	Piculs.
Cavite (reports from 8 municipalities):					
Rice	do	50	3,790	38,000	Cavans.
Sugar cane	do	248	190	4,975	Piculs.
Coconuts	do			24,000	Nuts.
Corn	do		13	124	Cavans.
Cebu (reports from 28 municipalities):					
Abaca	Fair	331	363	1,751	Piculs.
Coconuts	Good			398,000	Nuts.
Corn	Fair	3,528	18,346	196,501	Cavans.
Sugar cane	Good	152	418	10,338	Piculs.
Ilocos Norte (reports from 9 municipalities):					
Sugar cane	do	387	564	795	Do.
Tobacco	do	24	225	16,160	Quintals.
Corn	do	105	190	1,500	Cavans.
Ilocos Sur (reports from 20 municipalities):					
Sugar cane	do	424	582	4,692	Piculs.
Corn	do	175	753	6,086	Cavans.
Tobacco	do	105	139	1,364	Quintals.
Maguay	Fair	4	641	2,346	Piculs.
Iloilo (reports from 13 municipalities):					
Sugar cane	Good	108	335	7,550	Do.
Tobacco	do	15	124	250	Quintals.
Corn	do	115	105	515	Cavans.
Coconuts	Fair			34,000	Nuts.
Isabela (reports from 4 municipalities):					
Rice	do				
Tobacco	do	158	18	275	Quintals.
Corn	Good	35	35	796	Cavans.
La Laguna (reports from 13 municipalities):					
Coconuts	Fair			320,000	Nuts.
Rice	Good	1,167	440	6,872	Cavans.
Sugar cane	Fair	315	575	17,250	Piculs.
Abaca	do	8	624	680	Do.
La Union (reports from 9 municipalities):					
Sugar cane	Good	172	505	3,282	Do.
Tobacco	do	239	1,642	4,276	Quintals.
Coconuts	Fair			6,000	Nuts.
Corn	Good	60			
Lepanto-Bontoc (reports from 15 municipalities):					
Sugar cane	do	27	31	255	Piculs.
Tobacco	Fair	6	48	187	Quintals.
Corn	Good	3			
Rice	do	237	101	337	Cavans.
Leyte (reports from 14 municipalities):					
Abaca	do	198	5,374	25,526	Piculs.
Coconuts	do			1,384,000	Nuts.
Corn	do	300	782	8,050	Cavans.
Sugar cane	do	139	168	1,534	Piculs.
Mindoro (reports from 2 municipalities):					
Tobacco	do	1	1	5	Quintals.
Corn	do	13	12	100	Cavans.
Coffee	do	1	1		
Coconuts	do			10,000	Nuts.
Misamis (reports from 6 municipalities):					
Coconuts	Fair			620,000	Do.
Corn	Good	103			
Abaca	do	3	120	1,045	Piculs.
Rice	Fair		100	846	Cavans.
Moro (reports from 4 municipalities):					
Coconuts	Good			214,000	Nuts.
Corn	Fair	21	9	270	Cavans.
Abaca	Good	3	82	859	Piculs.
Rice	Fair	7	36	720	Cavans.

Crops planted and harvested and condition of same taken from monthly crop reporters for the month of March, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Nueva Ecija (reports from 16 municipalities):		Hectares.	Hectares.		
Sugar cane	Good	14	94	1,410	Piculs.
Tobacco	Fair	5	92	572	Quintals.
Corn	Good	10	11	80	Cavans.
Nueva Vizcaya (reports from 3 municipalities):					
Sugar cane	do				
Tobacco	do				
Corn	do				
Coconuts	do				
Occidental Negros (reports from 10 municipalities):					
Sugar cane	do	2,000	20,960	117,360	Piculs.
Tobacco	do		101	1,005	Quintals.
Abaca	Fair		151	681	Piculs.
Corn	do	50	40	1,200	Cavans.
Oriental Negros (reports from 14 municipalities):					
Coconuts	Good			631,000	Nuts.
Tobacco	Fair		84	2,960	Quintals.
Corn	do	40	278	100,000	Cavans.
Sugar cane	do	90	128	7,000	Piculs.
Palawan (reports from 2 municipalities):					
Coconuts				300,000	Nuts.
Pampanga (reports from 8 municipalities):					
Rice	Good	1,000	40,083	96,950	Cavans.
Sugar cane	do	4,250	6,970	30,310	Piculs.
Corn	do	35	20	20	Cavans.
Pangasinan (reports from 28 municipalities):					
Coconuts	do			307,000	Nuts.
Tobacco	do	45	322	2,453	Quintals.
Sugar cane	do	1,103	599	3,743	Piculs.
Corn	do	421	147	1,457	Cavans.
Rizal (reports from 15 municipalities):					
Rice	do	168	500	1,200	Do.
Sugar cane	do	756	908	7,910	Piculs.
Corn	Fair	75	100	10,000	Cavans.
Coconuts	do				
Samar (reports from 24 municipalities):					
Rice	do	158	898	7,020	Do.
Abaca	do	226	1,987	16,441	Piculs.
Coconuts	do			549,000	Nuts.
Sugar cane	Good	19	29	75	Piculs.
Sorsogon (reports from 14 municipalities):					
Corn	do	24	47	347	Cavans.
Coconuts	do			41,000	Nuts.
Rice	Fair	10	602	3,185	Cavans.
Abaca	Good	62	1,742	6,782	Piculs.
Surigao (reports from 5 municipalities):					
Rice	do		250	2,000	Cavans.
Abaca	Fair	50	600	5,013	Piculs.
Coconuts	Good			80,000	Nuts.
Corn	do	56	10	200	Cavans.
Tarlac (reports from 10 municipalities):					
Rice	do	412	5	80	Do.
Sugar cane	do	710	457	4,836	Piculs.
Corn	do	8	110	271	Cavans.
Tobacco	do	17	73	650	Quintals.
Tayabas (reports from 18 municipalities):					
Coconuts	Fair			2,893,000	Nuts.
Sugar cane	Good	3	31	229	Piculs.
Rice	do	2,150	100	1,347	Cavans.
Abaca	Fair	39	600	1,104	Piculs.
Zambales (reports from 6 municipalities):					
Coconuts	do			20,000	Nuts.
Sugar cane	do	20	5	115	Piculs.
Corn	do	35	2	8	Cavans.
Tobacco	Good	6		3	Quintals.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

*Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the
month of March, 1909.*

Province.	Unhulled rice, per cavan.		Abaca, per picul.		Copra, per picul.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	P3.50	P2.00	P6.00	P4.00	P7.00	P7.00
Albay	3.75	2.30	6.00	4.50	7.50	6.00
Ambos Camarines	4.00	2.00	11.50	3.75	7.00	2.00
Antique	3.00	1.50	22.00	12.00	6.50	6.00
Bataan	2.50	2.00			4.50	4.50
Batangas	3.50	2.00	8.00	4.00		
Benguet	5.00	3.00	9.50	9.50	7.00	7.00
Bohol	3.75	2.00	13.75	10.00	9.26	7.00
Bulacan	2.50	2.00				
Cagayan	4.00	3.00				
Capiz	3.75	1.66	18.00	7.00	7.00	5.00
Cavite	3.00	2.00	12.00	11.00	6.00	6.00
Cebu	4.50	3.00	20.00	10.00	9.00	7.00
Ilocos Norte	5.00	4.00				
Ilocos Sur	5.00	2.30				
Iloilo	4.50	2.00	18.00	12.00	8.00	6.00
Isabela	4.00	4.00				
La Laguna	3.80	2.40	15.00	6.50	7.00	5.00
La Union	3.50	2.50			6.00	5.00
Lepanto-Bontoc	4.00	3.00				
Leyte	5.00	2.50	11.00	4.50	7.50	2.25
Mindoro	3.00	3.00	8.00	8.00	5.00	5.00
Misamis	3.30	2.00	7.50	5.50	7.50	6.75
Moro	3.50	2.00	11.00	5.77	7.50	5.50
Nueva Ecija	2.00	1.25				
Nueva Vizcaya	1.50	1.25				
Occidental Negros	3.00	2.50	14.00	8.00	7.50	2.50
Oriental Negros	5.00	2.50	14.00	5.50	8.60	6.00
Palawan	3.00	3.00			5.50	5.00
Pampanga	2.25	1.75				
Pangasinan	5.00	2.00			8.00	4.50
Rizal	2.75	2.25	18.00	18.00		
Samar	5.00	2.50	14.00	8.00	7.50	5.00
Sorsogon	3.25	2.50	12.00	3.50	6.75	5.00
Surigao	3.12	3.00	17.50	7.50	7.25	6.00
Tarlac	3.75	1.50				
Tayabas	5.00	2.50	12.00	3.00	6.75	4.00
Zambales	4.00	1.50			10.00	3.50

Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the month of March, 1909—Continued.

Province.	Sugar, per picul.		Tobacco, per quintal.		Corn, per cavan.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan					₱2.25	₱2.25
Albay	₱7.00	₱6.00			3.00	1.50
Ambos Camarines	5.00	4.00			4.00	1.00
Antique	4.00	3.00	₱25.00	₱25.00	2.50	1.50
Bataan	4.00	4.00			3.00	3.00
Batangas	4.20	3.00	8.00	5.00	4.00	2.00
Benguet	6.00	3.00			4.00	3.50
Bohol	6.00	4.00	52.00	3.50	5.00	2.50
Bulacan	7.00	5.50	10.00	10.00	2.50	2.00
Cagayan	4.00	4.00	15.00	8.00	4.00	2.00
Capiz	7.00	6.00	8.00	4.00	5.00	1.12
Cavite	4.20	2.50			3.00	2.25
Cebu	5.00	2.00	25.00	4.00	4.50	2.50
Ilocos Norte	3.00	2.00	18.00	3.00	2.50	1.00
Ilocos Sur	7.00	2.00	60.00	3.50	5.00	2.00
Iloilo	6.00	3.50	40.00	5.00	4.00	2.50
Isabela			47.50	1.66	2.80	2.80
La Laguna	5.00	3.00			5.00	2.00
La Union	6.00	2.50	8.00	1.00		
Lepanto-Bontoc	6.00	2.00	5.50	3.00	4.20	4.20
Leyte	5.50	3.50	52.00	15.00	3.50	1.70
Mindoro			15.00	15.00	2.50	2.50
Misamis	4.00	4.00	25.00	9.00	3.50	2.50
Moro	5.25	5.25	7.00	7.00	3.50	2.00
Nueva Ecija	7.50	2.50	20.00	4.00	2.50	1.25
Nueva Viscaya						
Occidental Negros	5.67	3.50	35.00	6.00	3.75	2.50
Oriental Negros	5.00	4.00	25.00	4.00	5.00	2.50
Palawan						
Pampanga	6.50	4.40	10.00	10.00	2.00	2.00
Pangasinan	6.50	2.50	30.00	2.00	5.00	1.50
Rizal	7.00	3.50			5.00	2.00
Samar	6.25	3.00	60.00	20.00	3.50	1.50
Sorsogon	2.50	2.50	14.00	12.00	1.50	1.25
Surigao					2.50	2.50
Tarlac	5.60	2.50	15.00	7.00	3.00	1.25
Tayabas	6.00	3.00	10.00	4.00	5.00	2.00
Zambales	5.00	2.00	12.00	12.00	5.00	2.00

PERIODICALS RECEIVED IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
The Queensland Agricultural Journal, Brisbane, Australia.
Tropical Agriculturist, Colombo, Ceylon.
Hawaiian Forester and Agriculturalist, Honolulu, Territory of Hawaii.
Memoirs of the Department of Agriculture, Calcutta, India.
Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
California Cultivator, Los Angeles, California.
The Rural California, Los Angeles, California.
Farmer and Fruit Grower, Jacksonville, Florida.
Louisiana Planter New Orleans, Louisiana.
Southern Cultivator, Atlanta, Georgia.
Progressive Farmer, Raleigh, North Carolina.
Farmer's Guide Huntington, Indiana.
Independent Farmer, Lincoln, Nebraska.
Kansas Farmer, Topeka, Kansas.
Farm Press, Chicago, Illinois.
The Feather, Washington, D. C.
The American Thresherman, Madison, Wisconsin.
Exporters and Importers Journal, Chicago, Illinois.
Oregon Agriculturist, Portland, Oregon.
Journal of Agriculture and Horticulture, Montreal, Canada.
Tropical Life, London, England.
Comercial America, Philadelphia, Pa.

REPORTS AND QUOTATIONS.

Crop Reporter, by the Secretary of Agriculture, Washington, D. C.
Federal Reporter, New York, N. Y.
Smith and Schipper's Monthly Report, New York, N. Y.
Hemp Market Report, Landauer & Company, London.
Ide and Christie's Monthly Circular, London.

LOCAL.

Official Gazette, Manila, P. I.
Philippine Journal of Science, Manila, P. I.
Far Eastern Review, Manila, P. I.
Weather Bureau Bulletins, Manila, P. I.
Philippine Agricultural Review.

SPANISH.

- Boletin de la Cámara de Comercio Filipina, Manila, P. I.
Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Havana,
Cuba.
Boletin de Agricultura, San José, Costa Rica.
Hacendado Mexicano, El, Mexico, Mexico.
Agricultor Peruano, El, Lima, Peru.
Prácticas Modernas é Industrias Rurales, La Coruña, Spain.
Hacienda, La, Buffalo, New York.

OTHER LANGUAGES.

- Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
Boletim Economique, Hanoi-Haiphong, Indo-China.
L'Agronomie Tropicale, Brussels, Belgium.
Boletim de Agricultura, Sao Paolo, Brazil.
Tamil Journal of South India Agriculture, Madras, India.
Station Agronomique, Port Louis, Colony of Mauritius.
Journal D'Agriculture Tropicale, Paris.
Der Pflanze, Kommunal-Druckerei, Tanga, Dutch, East Africa.

THE PUBLICATIONS OF THE BUREAU OF AGRICULTURE.

The following-named bulletins of the Bureau of Agriculture are available for distribution, and will be sent free of charge to any address upon application. Applicants are requested to state whether all publications of the Bureau are desired as issued, or only those specified. The name and address of the applicant should be plainly written and all communications should be addressed to the Director of Agriculture, Manila, Philippine Islands.

FARMERS' BULLETINS.

- No. 4. Preliminary Report on Commercial Fibers of the Philippines. (Spanish.)
- No. 6. Experimental Work with Fungous Diseases of Grasshoppers. (Spanish.)
- No. 9. A few Suggestions on the Cultivation of Cotton. (Spanish.)
- No. 11. The Jute Industry. (Spanish.)
- No. 12. Abacá. (Manila Hemp.) (English.)
- No. 13. The Cultivation of Maguey in the Philippine Islands. (English and Spanish.)
- No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
- No. 15. Tobacco Growing in the Philippines. (English and Spanish.)

PRESS BULLETINS.

- No. 6. The Tamarind. (English.)
- No. 8. Maguey; Propagating Abacá from Seed; etc. (English.)
- No. 9. Agricultural Districts; Control of Rinderpest; etc. (English.)
- No. 11. Seed Distribution; Need of Diversified Farming; etc. (English and Spanish.)

POPULAR BULLETINS.

- No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
- No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)



PLATE I.—NELLORE BULL AT TRINIDAD STOCK FARM.

Age, 3½ years; weight, 566.98 kilos; height, 164 centimeters; length, 230 centimeters; heart girth, 196 centimeters; flank girth, 207 centimeters.

THE PHILIPPINE *Agricultural Review*

VOL. II

JULY, 1909

No. 7

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	363
The Tropical Exhibition, Olympia (London), July, 1909 (Announcement).....	367
The Agri-Horticultural Show in Penang, August, 1909 (Announcement).....	367
The Fiber Congress at Sourabaya, October, 1910 (Announcement).....	368
Locusts, Wm. D. Hobart, Division of Statistics.....	370
The Nellore Cattle, Frank C. Gearhart, D. V. M., Acting Chief Veterinarian.....	372
The Ongole Cattle Show and the Arni Agri-Horticultural Exhibition.....	375
Additional Notes on Rice Growing, Silverio Apostol, Agricultural Assistant.....	378
Popular Agricultural Instruction in the United States, E. A. Coddington, Assistant Editor	380
Hawaii's Annual Poultry Exhibition	389
Four Years' Experience Growing Rubber Trees on Basilan, Carl F. Miller.....	394
The Importance of Agricultural Education for Capiz Province, R. L. Clute, Agricultural Assistant	404
Notes from Other Fields: Comparative Table of Rubber Exports for the Federated Malay States, 1908 and 1909; Coffee as a Catch Crop with Rubber; Peanut Cultivation in Burma; Cotton Growing Experiments in the Hawaiian Islands; The Production of Sugar in Cuba; The Cacao Market of the Portuguese Islands; The Demand for Annatto Seed in the United States; Egg-laying Competition; Peanut Oil	407
Agricultural Notes.....	411
Crop Reports for April	414
Range of Prices of Philippine Agricultural Products.....	417
Periodicals in the Library of the Bureau of Agriculture.....	419
The Publications of the Bureau of Agriculture.....	421

ILLUSTRATIONS.

PLATE I. Nellore Bull at Trinidad Stock Farm.....	Frontispiece.
	Facing page—
II. Three Nellore Cows at Trinidad Stock Farm.....	372
III. The Results of Cultivating Maize or Indian Corn.....	404

EDITORIAL.

LOCUSTS.

In this number of the REVIEW we are presenting a short article on the threatened locust pest which has been reported from more than one-half of the agricultural provinces in the Islands. The importance of giving this matter immediate attention can hardly be overemphasized, as is well understood by those who have seen the results of the work of swarms

of locusts in various parts of the Islands in times past. Unless this matter receives prompt attention by the farmers as well as by municipal and provincial officials there is sure to be a famine in some of these provinces during the coming year as a result of the destruction of the crops by locusts.

FARMERS' QUESTION PAGE.

The editors of the REVIEW desire to bring the Bureau of Agriculture as closely in touch with the farmers as possible, and to this end the Editor has decided to give space in the REVIEW for a farmers' question page on which replies to questions from farmers will be taken up and answered as promptly as possible. It is the desire of the Director that communications intended for this department of the REVIEW be addressed to the Editor of THE PHILIPPINE AGRICULTURAL REVIEW, and that they be confined as closely as possible to practical problems in agriculture—such questions as when answered will immediately benefit the individual farmer.

THE NELLORE CATTLE.

Two of the most interesting articles in this number of the REVIEW, particularly to the farmers of Negros, Bulacan, Pampanga, and other sections where cattle are used as draft animals, are those on the Nellore cattle by Dr. Frank C. Gearhart, acting chief veterinarian of the Bureau of Agriculture, and the one on the Ongole Cattle Show and Arni Agri-Horticultural Exhibition from the Madras Mail of April 6, 1909. The Nellore cattle which were recently imported from India have been inspected and admired by many people and, in case they adapt themselves to the conditions of this climate, there is every reason to believe that this is a step in the way of a revolution in the cattle-raising business of the Philippines. It would seem that a breed of cattle better suited to the needs of Philippine agriculturists will be available in the near future.

AGRICULTURAL EXHIBITIONS.

This number of the REVIEW contains the announcements, or accounts, of five different agricultural exhibitions which have taken place or, with one exception, will take place in the near future. In fact this may be regarded as the first exposition number of THE PHILIPPINE AGRICULTURAL REVIEW.

The account of the Annual Poultry Show in Hawaii is only a suggestion as to what could and ought to be done along these lines in the Philippine Islands. Hawaii, as compared with the Philippines, imports only a small amount of eggs and poultry, \$16,511 as against \$253,661 for the year 1908. Such an exposition in the Philippines would give Philip-

pine poultry growers an idea of the comparative value of the stock they are now raising, and it would indicate the lines along which progress can most easily be made in order to make the industry meet the demands of the Philippine market.

The Ongole cattle show held in the Madras Presidency in India was one of the most important exhibitions of the kind that has been held for many years. It is well known that the Hindoos worship cattle, and in Madras they have given special attention to breeding. As an illustration of what can be done by giving attention to the marked characteristics of different kinds of stock, and by careful selection in breeding, we have the Nellore cattle. When considering the actual needs of the Philippine farmer, no one can question the superiority of these animals over the animals commonly raised and used in the Islands.

The agri-horticultural show which will be held in Penang in August is just the kind of agricultural exposition which should be held in every agricultural province of the Philippines as soon as possible. In Queensland there are at present over 200 agricultural societies and organizations, 25 of which have already announced the dates for holding their expositions this year. In New South Wales there are over 40 such organizations, all of which will hold fairs this year; Victoria and Western Australia have over 100 such societies.

The fiber congress, which is for the purpose of discussing the fiber-growing industry in tropical countries, and for the exhibition of the best kinds of machinery for stripping and preparing fibers for market, is one which should be of more than usual interest to Philippine agriculturists, more especially the maguey and hemp growers of the Islands. Matters of interest are bound to be brought out in the discussions which will take place at Sourabaya in October of next year, and the privilege of seeing in operation the various kinds of fiber-stripping machinery, which will be exhibited on that occasion, will be of inestimable value to Philippine fiber growers, and they should see to it that a sufficient number of delegates are sent to this congress, not only in behalf of the associations of fiber growers and agriculturists but by the Government, for promoting one of the first industries of the country.

The announcement of the tropical exhibition, which takes place this month in Olympia, for the purpose of promoting travel and commerce with the tropics, should be of interest to everyone who is anxious to promote agriculture, trade, and commerce in the Philippines. It is presumed that practically everyone knows of the enormous sums of money which are spent each year in Japan by travelers and tourists, simply because the Japanese have made the most of the natural conditions and advantages of their country, and have been keen enough to make them known to the world, particularly to those who travel. To those who are thoroughly familiar with Japan and the Philippines it seems that as a place of interest to tourists and travelers the Philippines have

fully as many points of scenic and historic interest as do the islands of the Japanese empire. It is largely a question of our improving the environment and the facilities for reaching such places as the Lake, Taal Volcano, Pagsanjan, Baguio, Mayon, the southern islands and the Moro country.

While the editors of the REVIEW are fully in sympathy with all work for the education of the people and the progress of the country, and most emphatically believe that these lines of work should be emphasized as best they can, at the same time in all of our work, in so far as we are not able to proceed by actual demonstrations, we are severely handicapped by the lack of information, of touch with the outside world, of scientific progress along agricultural and other lines, on the part of the Filipinos. However simple we make our instructions and however important or significant may be the reason for our efforts, yet the average citizen or farmer fails to appreciate them or to see them from our point of view. We are of the opinion that the only way to get immediate results in the line of agricultural work and the development of the country is by actual demonstrations. We doubt the possibility of making the Filipino farmer realize the importance of raising better poultry, better hogs, better cattle, better horses, and better plant products on the farm, in any other way than by actually bringing him into competition with his fellow-farmers and showing him how poor the present products of his farm are as compared with those of other Filipino farmers who give some attention to the science of agriculture. Only when he sees the actual results of better attention to these subjects, as they are shown at a fair or exhibition, will he be ready and anxious to know how such results are to be obtained and to profit by the larger financial returns which come to the intelligent farmer. In fact, we believe that all that we can do in other ways will meet with little response from the average agriculturist in this country, as compared with the effect of bringing him into competition and face to face with actual results in a manner which affects his personal pride, as well as his financial interests. In this manner only do we believe he can be made to respond to and realize the significance and importance of the work which we are urging him to undertake.

The coming Carnival will afford an opportunity for various kinds of agricultural and industrial exhibitions, and it is understood that the directors of the Carnival are anxious to have the provinces and the people in the country take as prominent a part as they can, and make the Carnival an Insular agricultural exposition or fair, which it eventually should be. In connection with the next Carnival it is hoped that a poultry show, a cattle exhibition, a horse show, a sugar-growers' congress, a tobacco-growers' congress, a fiber congress, and an agri-horticultural show will be prominent features.

**THE TROPICAL EXHIBITION,¹ OLYMPIA,
JULY, 1909.**

ANNOUNCEMENT.

To promote travel and commerce with the tropics.

President, Sir Gilbert Parker, D. C. L., M. P.

Chairman, Col. W. J. Bosworth.

Manager, A. Staines Manders.

Exhibition offices, 75 Chancery Lane (Holborn), London, W. C.

Representatives desired in every country. Correspondence invited.

The travel and tropical exhibition is making rapid progress. The British Cotton Growing Association states that it will require a floor space of over 40 square feet, besides wall space for photographs, etc.; Messrs. Elders and Fyffes, Limited, will exhibit bananas.

¹ Tropical Life: Vol. V, No. 3, March, 1909.

THE AGRI-HORTICULTURAL SHOW IN PENANG, AUGUST, 1909.¹

ANNOUNCEMENT.

At a meeting of the central committee held in the governor's office, Government Buildings, Penang, on the 5th instant, it was decided to hold the next agri-horticultural show on the 9th, 10th, and 11th of August. These dates were considered as most suitable by reason of the fact that the fruit season is then about at its best; further, there are two public holidays in Penang at that time, thus enabling the sub-committees to have more time for the receiving and dispatching of exhibits. Circulars in the various vernacular languages are being prepared, and will be issued this week, stating the objects for which the exhibition is held. It is hoped that all intending exhibitors will begin at once to prepare their exhibits.

¹ Agricultural Bulletin of the Straits and Federated Malay States, Vol. VIII, No. 4, April, 1909.

THE FIBER CONGRESS AT SOURABAYA, OCTOBER, 1910.

ANNOUNCEMENT.

With a view to promoting the cultivation of fiber-producing plants, the Nederlandsch-Indisch Landbouw Syndicaat has decided to hold, at Sourabaya, Java, Netherlands East India, in October, 1910, a congress combined with an exhibition of fiber-producing plants, of the fibers produced therefrom, and of the machinery used in the preparation of the same.

During the congress the cultivation and preparation of the raw fiber, both mechanically and manually, will be discussed. The extraction, preparation for market, and packing of the fiber will, as far as possible, be demonstrated. Various prizes, medals, diplomas, and money prizes will be offered for machinery. Prizes will be awarded to the exhibitors of machines working for a sufficient time during the congress that are considered worthy of an award by a committee of impartial experts. The expenses of the congress and exhibition will be defrayed by the syndicate, which is enabled to do so by a liberal grant from the Netherlands Indian Government and substantial contributions from commercial houses and private persons.

In conjunction with the director of agriculture a committee has been formed to prepare and carry out the scheme, while a number of gentlemen in Holland have been requested to form a subcommittee there. A prominent place in the programme will be given to the consideration of the cultivation and preparation of those fibers most suitable for culture on a large scale in the tropics. Special attention will be given to the following, viz:

- (1) Agave fiber, the cultivation of which is spreading so largely and which is specially adapted to dry tropical countries.
- (2) Manila hemp, also a fibrous plant fit for cultivation on a large scale, which produces a profitable crop in well-watered districts of tropical countries.
- (3) Jute and jute substitutes. Of importance in all tropical countries, seeing that a large part of the packing material necessary for other produce is made therefrom. As the cultivation of agave fibers and Manila hemp and the like can be remunerative only when carried on with efficient machinery for the treatment of the fiber on a large scale,

and when suitable hand machines are available for the use of the small producer, special attention will be paid to the testing of machines sent to the congress for exhibition, as regards both the extraction and treatment of the fiber. In addition to the above named, other fibers may be dealt with more or less fully according to the interest shown at the congress.

A detailed programme will shortly be published dealing with the project in all its particulars and enumerating the prizes to be awarded. This preliminary notice will serve to make known to all those who are interested in the cultivation of fibers in tropical countries the opportunity shortly to be offered of exchanging ideas on the subject, and will give timely notice to manufacturers of machinery of the opportunity to be given for displaying the merits of their respective machines.

LOCUSTS.

By WM. D. HOBART, *Division of Statistics.*

Up to the time of going to press, the Bureau of Agriculture has received information from eleven provinces that swarms of locusts have been observed, and in some of these provinces considerable damage has already been done to growing crops. The provinces afflicted are Bataan, Batangas, Bulacan, Capiz (including the subprovince of Romblon), Cavite, Cebu, Iloilo, Occidental Negros, Oriental Negros, Pampanga, and Rizal.

Upon learning that a locust plague was imminent prompt steps were taken to check it so far as possible. In the weekly crop report of May 26 special stress was laid upon the necessity of the coöperation of the agriculturists along the lines provided for in Act No. 817, of August 3, 1903, which was passed at a time when crops generally were suffering from this pest. Again, in the crop report of June 2, prompt action was urged and Act No. 133, section 1 (6), was quoted, under which, when locusts appear, provincial boards are authorized to vote funds for the employment of a temporary force of employees and lay down the regulations under which they shall combat them.

The Executive Bureau has sent out a circular letter urging provincial boards in the provinces affected to institute a vigorous campaign against locusts, and to stop further spread of this scourge if possible.

This was followed by a circular letter of the Bureau of Agriculture to provincial boards in all of the provinces, giving them information as to the habits of locusts and modern methods of fighting them, as furnished by the Bureau of Science. The circular was largely a reproduction of an article appearing in the AGRICULTURAL REVIEW for May, 1908, and it is suggested that all interested in this subject read this article again at the present time. The Bureau of Science in a recent communication to this Bureau strongly urges trying a measure suggested by them for killing the full-grown locusts, which is the building of huge bonfires at night to attract them, when they can be killed in large numbers.

When the eggs have been laid many of them can be destroyed by plowing up the land; but when that is not possible, destroying the young during the month before their wings are full grown is comparatively

much easier than later when they can fly. Killing them by covering the ground with dry grass when they are hatching out and setting fire to it has proved very effective and may be supplemented by catching, with nets, those who escape, while they are still weak.

The destruction of insects by every known means at the present time is of such vital importance to crops of all kinds that the farmers, who are directly interested, with the aid of provincial and municipal authorities, are urged to exert their utmost powers in a campaign which should be short if all will take part in it.

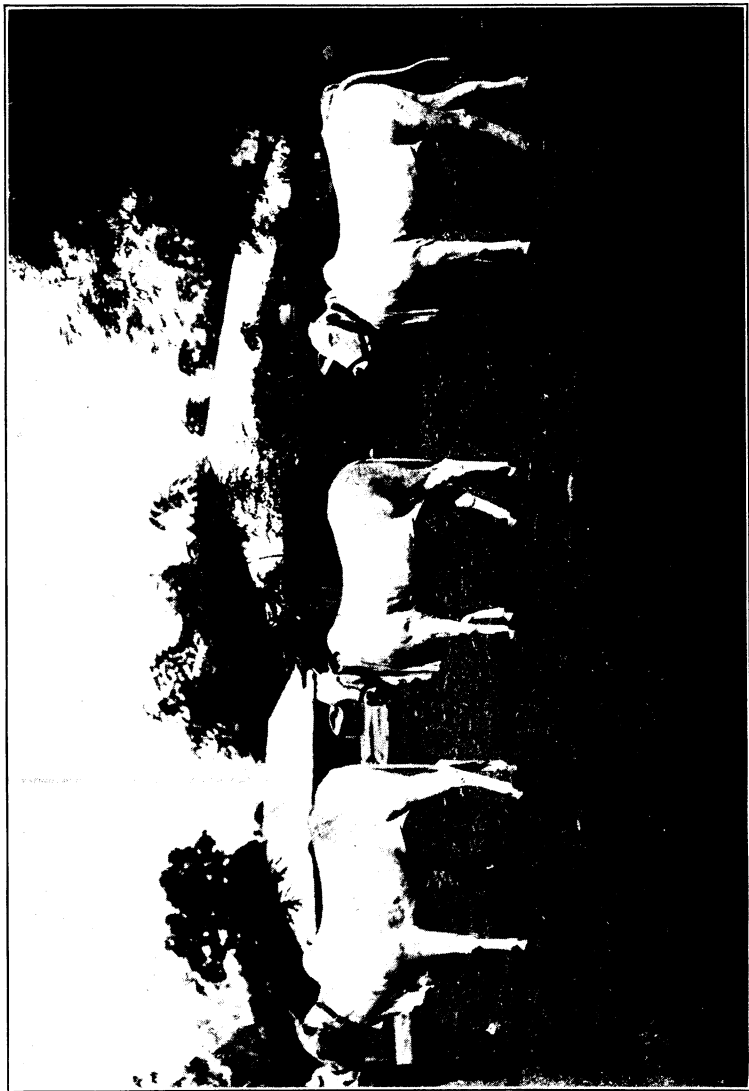


PLATE II.—THREE NELLORE COWS AT TRINIDAD STOCK FARM.

Average age, 2½ years; average weight, 362.87 kilos; average height, 153 centimeters; average length, 210 centimeters; average heart girth, 178 centimeters; average flank girth, 182 centimeters.

THE NELLORE CATTLE.

By FRANK C. GEARHART, D. V. M., *Acting Chief Veterinarian.*

During the month just past the division of animal industry received a very fine shipment of Nellore cattle. The photographs of some of them are here given. They were selected with great care at the annual Ongole cattle show in the district of Nellore, Madras Presidency, by Lieut. Col. Gunn, M. R. C. V. S., superintendent of the civil veterinary department, Madras, who made the purchase aided by Mr. N. B. Stewart, American consul at Madras. None but strictly first-class cattle were selected, several of them winning prizes at the fair. The original purchases consisted of 10 young cows, many of them pregnant, and 2 medium-aged bulls. One fine female calf was born en route and another soon after the dam's arrival in Manila, so that the herd now numbers 14 head and the indications are that this number will be augmented.

One bull, four cows, and a calf were disembarked at Iloilo and taken to the comparatively rich pastures on the Government farm at La Carlota, Negros. Here they will experience about the same climatic conditions as affect the greater part of the labor animals of the Archipelago. The young bulls will be broken at proper age and their efficiency as draft animals under prevailing conditions will be tested before they are disposed of for breeding purposes. Because of their large size and their ability to cover ground at a rapid pace it is believed that they will be of special value to the sugar growers of Negros. The ordinary bullock, principally because of his lack of weight, has never been popular in this section of the country as a draft animal, and the carabao used so extensively does not fulfill the needs for many reasons, the chief ones being his very slow gait and nonresistance to disease.

The remaining portion of the herd with the exception of the young calf and its mother, which will be sent later, have been taken to the Trinidad stock farm in Benguet. In addition to the one object of demonstrating their worth as transportation animals on the mountain trails and roads, it is the desire of the Bureau to observe them under mountain conditions, and if they prove a success, to interest the large number of live-stock growers in the provinces and endeavor to influence them to use these cattle in improving their native breeding stock. The

native cattle now being produced in comparatively large numbers in the provinces have little to commend them, except the one important feature of hardiness. They are in the main small and wild, and are therefore of but little value except for their hides and meat.

The mountain provinces have many natural advantages over the larger part of the remaining portion of the country conducive to successful cattle raising, such as a constant supply of pure water, a superior grass, and, most important of all, they are isolated to a great extent from the sources of dangerous infectious diseases. The supply is sure to exceed the local demand and it is very important that the surplus sent out be of a satisfactory working type and disposition, for it is work cattle and not beef animals that the lower provinces are so much in need of at the present time. The indications are that the demand will steadily increase during coming years.

If after a short trial these cattle evidence a disposition to adapt themselves to the climate, feed, and needs of this country, and thus fulfill the reasonable and well-founded expectations of their promoters, others will be secured.

The natural habitat of the Nellore breed is hot and dry and the question of their thriving in a country where the rainfall is as great as it is in these Islands has been raised. Though time and experience only can decide this question definitely, the writer and many others are of the opinion that they will adjust themselves to the differences in climatic conditions in a very satisfactory manner.

Though in many respects European breeds of cattle may be superior to those indigenous to the Orient, they have not as yet proven to be of any value in Asia and the adjoining islands under the natural range conditions. A careful study of the many and varied conditions affecting the welfare of cattle to be found in Asia and the Philippines leads one to believe that the Asiatic breeds will thrive in a satisfactory manner under commonplace conditions in this country. This conclusion has been supported by very satisfactory results obtained here from breeding Chinese and Indo-Chinese cattle. The cattle of India, though raised under much the same conditions as regards climate and feed, are, because of selection for a great number of years, much superior to the cattle found in the other two countries named.

More than 800 Nellore cattle have previously been shipped to the hot regions of Brazil and are reported as doing well especially when crossed with native breeds. Two years ago 200 Mysore cattle were sent to Java and have proved such a success that the Dutch government now has agents in Ongole buying the Nellore breed which is much finer and more expensive than that of the State of Mysore.

In no country of the world, with the possible exception of the Jersey and Guernsey islands, has any one breed of cattle been found to be the best breed for all sections of the country. This assumption holds

true to a less extent for all other animals. Therefore it is the policy of this Bureau to bring to this country other cattle than those coming from the Nellore district. The Nellore cattle will likely do well in most parts of this country, but it is reasonable to suppose that they will do better in some sections than in others. Among the many breeds or varieties of cattle in India there are undoubtedly others that in certain sections of this country will surpass those originating in the Nellore district. The Nellore breed has been selected for the initial herd because it possesses many superior points in conformation and labor-performing qualities over the cattle from other districts of India.

THE ONGOLE CATTLE SHOW AND THE ARNI AGRI-HORTICULTURAL EXHIBITION.¹

The Ongole cattle show which closed on Saturday was, on the whole, a great success; though the number of exhibits was not as large as at some previous shows, the quality was pronounced to be the finest that has been seen at these shows for the past five years. This show is the outcome of the remarkable agricultural movement set on foot a few years ago largely through the enthusiasm of the Hon. Mr. A. E. Castle Stuart, who has played the part of an agricultural missionary with great success. His intimate knowledge of the ryot population and of the cattle breeders of the district, his power of persuasion, and his friendly and familiar talks with the ryots in their own language, have made him *persona grata* with them, and all of those influences have combined to give the movement a strong impetus. Though essentially a local one, this show has rightly come to be regarded as a provincial institution and has been deservedly helped and encouraged financially and otherwise by the department of agriculture. As a mart for the exhibition of the best animals of the celebrated Ongole breed, it has proved of great service to cattle breeders. It has attracted almost world-wide attention, and during the last five years sales to the extent of several hundred thousand rupees have taken place at the show, the purchase in a large number of cases having been made for foreign governments. In fact, so great has been the demand for the best Ongole cattle that already people in the locality are beginning to be seriously agitated over the threatened depletion of their best stock of animals, a matter which was prominently brought to notice this year by the organizers, and dwelt upon at some length by Mr. Castle Stuart in his speech. Those who have followed the development of the show from its inauguration have observed a striking improvement in the breed, a result which is mainly traceable to the influence of the shows and the opportunities they have afforded cattle breeders for studying the points of excellence in the best specimens of the breed and of perpetuating them by careful selective breeding. The Ongole cattle show has come to stay, and there should be a great future before it, if only cattle breeders and ryots will make the best of the opportunities afforded them to improve their prospects.

¹ From the Madras Mail of April 6, 1909.

In his opening address, Mr. Castle Stuart gave some good advice to cattle breeders and ryots and quoted statistics which ought to open their eyes to the large possibilities in store for them. He tried to correct some of the common misapprehensions on the part of the people in regard to the provision of pasturage for cattle, and emphasized the need for hand-feeding and stall-feeding of the animals if the breed is not to deteriorate by indiscriminate and promiscuous herding of cattle. He urged the cattle breeders of the district to pay particular attention to the cultivation of the very best fodder crops, more especially cholam, guinea grass, and lucernes. Finally he impressed upon them the vital necessity of maintaining the breed true to type, to increase their numbers and to improve their quality by careful selection and good management. This distribution of prizes on Saturday was characterized by much enthusiasm and was the occasion for well-deserved congratulations all round. Lieut. Col. W. D. Gunn made an interesting speech to the cattle breeders, telling them to remember that they could get good prices only on condition that they bred good animals; to keep as many of their best cows as possible in order to keep the monopoly in their own hands; to breed from only the best and soundest stock, and to maintain the show as an annual function—points which were reënforced in another telling speech by Mr. Castle Stuart. It must be a matter of great satisfaction to the organizers of the show and a source of encouragement to the cattle breeders to know that 484 out of about 600 animals exhibited have been sold, the bulk of the purchases being made for the Java government, the Government of the Philippines, Jamaica, Brazil, and a Bombay firm for export. The organizers of the show are to be congratulated on the success which has attended their efforts.

ARNI AGRI-HORTICULTURAL EXHIBITION.

Another equally valuable and interesting show from the point of view of the agricultural improvement and rural economics was the agri-horticultural exhibition organized by the young Jaghirdar of Arni and opened on Saturday by the Hon. Mr. Murray Hammick. Considerable enterprise was shown by the Jaghirdar and the honorary secretary in bringing together a varied, interesting and large collection of agricultural products from all parts of the country. Mr. Hammick delivered a thoughtful speech in which he dwelt on the part which the landed aristocracy of this country can and ought to play in its agricultural and general development. There is indeed great scope for useful and philanthropic work by zemindars if they will only rise to their duty and to a sense of their responsibility. They are the natural leaders of their community, which has a right to look to them for light and leading. In the Madras Presidency there are many ancient zemindaries covering large tracts of country and possessing a numerous tenantry. The zemindars' responsibility is very great and important, and they can not

be too zealous in the discharge of their numerous duties. Great is their opportunity now, when the country is on the eve of important reforms in which they will play a prominent and important part as hereditary leaders and representatives of the people, to whom, as his excellency the viceroy remarked in his speech at Lahore, the government must look for information and guidance. The words of advice which Mr. Hammick offered to the zemindars were also apt and timely, and it is sincerely to be hoped that they will be laid to heart.

ADDITIONAL NOTES ON RICE CULTURE.

By SILVERIO APOSTOL, *Agricultural Assistant.*

METHODS OF SEEDING.

In addition to the report on rice cultivation in Zambales and Pangasinan published in the May number of the REVIEW, the writer desires to mention a third method of seeding, or preparing the "semillero," practiced by the rice growers of a great portion of the Province of Nueva Ecija. This is done where the water supply is under control. The ground, as usual, is plowed and harrowed three or four times, or until it is well pulverized for good germination. The seed is put in a rice sack and then placed in water and left there to soak. After three or four hours the seed is removed from the water and hung up wet for about twenty-four hours, or until at least about 50 per cent of the grains have sprouted, when it is sown broadcast on strips or lots about 8 or 9 feet in width. The soil at the time of sowing must be well saturated and kept in that state until the young plants have acquired sufficient height and vigor to stand more water. Some farmers keep their seed beds under water all the time, while others cut off the water supply for a day or so every once in a while and thus expose the growing plants and the soil to the free action of the sunshine and air.

Of the three methods of seeding—namely, (1) the one described in the foregoing, (2) that by drilling the seed, or the Ilocano method, and (3) that by sowing it without sprouting on a drier bed than that used for sprouted seed—I have been informed by almost everyone who is familiar with them that the Ilocano method of drilling is the surest, especially where there is any danger from lack of rain or the water supply is not under control. The seed being equal, the Ilocano method generally gives a germination of not less than 90 per cent, while either of the other two methods gives only 75 or 80 per cent or less. On the other hand, the seed stools less with the Ilocano method of seeding. There is no noticeable difference, however, in the behavior of the plants transplanted from seedlings produced by these three different methods of seeding.

In Tarlac Province, especially in the municipalities of Capas, Tarlac, and Concepcion, dry-season rice growing is more or less practiced. Of course only those lands with artificial irrigation can be utilized for this purpose, and there is only a small area in each town that has such

requirements. There are a number of varieties adapted to the dry season. They are collectively called "palakaya" or "tag-araw" rice; "inita," an awnless variety, is the one mostly grown. The planting is done during the early part of February and the crop is harvested in May. The process of growing or cultivation is very simple: After the land is cleared of the regular crop—about the middle of January—the field is flooded, drained, and then the rice stubble is plowed under. Some plow the ground a second time, then it is harrowed and the seed is sown broadcast while the soil is still saturated. I can not give the exact rate of sowing because I could find no one who was able to furnish such data. From what I have seen, however, I reckon it to be about $1\frac{1}{2}$ *cavanes* of seed to a *balita* of land, or about 375 liters (10 bushels) per hectare. After the seed has germinated and rooted, and is therefore free from the danger of floating or being washed away, should there be any danger of the young plants suffering from drought, it may be watered again and drained. The water has to be kept on after the plants have produced three or four leaves and cut off again after they have fully headed. It is said that only from 6 to 10 "cavanes" (450 to 750 liters), generally about 7, of crop are obtained from dry-season rice.

In Zambales Province the highland rice growers, like the American Indians, I am told, practice boiling the rice before hulling it, after which it is cooked and used for food. This is done when the rice has been freshly cut and thrashed and sometimes is still green, or when there is not enough sunshine to properly dry the paddy. The process of boiling is rather one of steaming than actually boiling. It is believed, and I know it is a fact, that by so doing the rice kernel is made tougher and thus is better able to stand the pressure of hulling.

POPULAR AGRICULTURAL INSTRUCTION IN THE UNITED STATES.

By E. A. CODDINGTON, *Assistant Editor*.

AGRICULTURAL EXHIBIT TRAINS.

For some years past it has been a custom in several of the Western States for the leading railroad companies to build and equip railroad cars, and for the State officials or promotion organizations to fill them with exhibits of the agricultural products from the different parts of a State to demonstrate the natural richness of the soils and the country for the purpose of inducing settlers and others to purchase lands in the State and develop its agricultural resources. These cars, with attendants, lecturers, and demonstrators, sometimes three or four of them together, having been thoroughly advertised in the sections to be visited, have been sent over all the principal railroad lines into the North and South Central, the Eastern, and the New England States, where they were sidetracked in the principal cities and exhibited their agricultural productions, while lectures were given and printed matter distributed with the purpose of giving the people in the more thickly settled sections of the United States an adequate idea of the wonderful agricultural possibilities in such States as Washington, Idaho, Oregon, Utah, and California.

In some cases boats have been equipped with similar exhibits and sent from port to port where they have remained several days at a time exhibiting the products of the particular State or section which they represent; in like manner lectures and descriptions of the country and its possibilities were given, and much printed and illustrated matter distributed. These methods of popular instruction or advertising have been carried on for years by various Western States and have given a wonderful stimulus to the development of agriculture west of the Mississippi River and along the Pacific coast.

AGRICULTURAL AND HORTICULTURAL DEMONSTRATION TRAINS.

In the March number of *The Rural Californian* we find the following notice of a special agricultural and horticultural demonstration train:

The Southern Pacific Railway Company will operate a special agricultural and horticultural demonstration train. The University of California and the State Horticultural Commission, through scientific and practical men, will have

delivered, at stopping points, lectures on methods to be pursued in increasing the value of agriculture, horticulture, live-stock raising, dairying, poultry raising, and kindred industries. The equipment of the train will include two cars containing valuable and comprehensive exhibits to be used in illustrating and demonstrating the points brought forth in the discussions. There will also be a coach for use as a lecture room in towns where no hall is available. Every person in the sections visited, who is interested, is earnestly invited to attend these meetings. Where the place of meeting is elsewhere than in the train it will be made known locally through the railway agents, newspapers, and other sources of information.

The schedule and speakers are as follows: Dr. Benjamin Ide Wheeler, president of the University of California; Prof. E. J. Wickson, director of the experiment station; Prof. W. T. Clark, superintendent of the department of university extension in agriculture; Prof. G. W. Shaw, of the cereal department; Prof. R. H. Loughridge, soils and fertilizers; Prof. E. W. Major, department of animal industry; Prof. W. B. Herms, medical entomology; Prof. H. M. Quayle, entomology; Dr. C. M. Haring, veterinary department; Prof. E. B. Babcock, department of plant pathology; Mrs. M. E. Sherman, viticulture, table grapes; Prof. R. E. Smith, southern California pathological laboratory, Whittier; H. J. Ramsey and T. F. Hunt, citrus experiment station, Riverside; J. B. Neff, Anaheim, conductor of farmers' institutes in southern California; J. W. Jefferey, State horticultural commissioner; E. M. Ehrhorn, deputy horticultural commissioner; E. K. Carnes, superintendent of State insectary; Frederick Maskey, fumigation expert.

According to the proposed schedule, the train will leave Los Angeles in the morning of March 10. The places to be visited and the hours at which meetings are to be held in those places will be as follows:

“Wednesday, March 10: Pasadena, 9.30 to 11.30 a. m.; San Marino, 1 to 2 p. m.; Arcadia, 2.10 to 3.10 p. m.; Monrovia, 3.30 to 4.20 p. m.; Duarte, 4.30 to 5.30 p. m., also 7.30 to 9.30 p. m.

Thursday, March 11: San Gabriel, 9 to 11 a. m.; Monte, 11.15 a. m. to 12.15 p. m., also 1.15 to 2.15 p. m.; London, 3 to 5 p. m., also 7.30 to 9.30 p. m.

FARMERS' INSTITUTE TRAINS.

More recently the large railroad companies have coöperated with the Department of Agriculture of the United States or the bureaus of agriculture in the different States and equipped cars while the National or one of the State departments of agriculture furnishes speakers and lecturers. These cars are sent through the sections which are specially devoted to some staple crop, such as corn, wheat, cotton, etc., and lectures are given at each station on the best methods of growing corn, wheat, or cotton—the subject being the staple crop of the section of country which each car visits.

In accordance with this plan each car proceeds on a well-advertised schedule, drawn by the trains of the railroad company, to the stations where it has been advertised and the people have already congregated. The people enter the car, are seated, and a lecture is given on the particular crop in which they are most interested; after the lecture is over the car is drawn by the railroad company to the next station, where the people are in waiting, and another lecture is given on the same subject. This is continued from station to station throughout the sections in which a particular crop is raised, and in this manner much

valuable information is disseminated and a great deal of interest and enthusiasm for more intelligent agricultural work is aroused.

This plan is usually carried out on the initiative of the great railroad companies for the increased profit that will come to them from the larger crops raised by the farmers along their lines and delivered to them for transportation. Usually the government of the State or the United States furnishes the literature and the necessary equipment or apparatus for the lectures and demonstrations, and the railroad company furnishes the car or cars and carries out the scheme according to their own convenience for the development of the country.

In the same number of *The Rural Californian* above mentioned we find the following notice of the Southern Pacific farmers' institute train:

In a communication to *The California Cultivator*, Prof. Warren T. Clark says in discussing the trips of the demonstration train now being run over the State: "The next trip, which will begin in the latter part of February, will cover a part of the southern portion of the State. The route taken will probably be as follows: Bakersfield, Lancaster, Newhall, Los Angeles, San Gabriel, Monte, Covina, San Dimas, Lordsburg, Pomona, Lemon, Chino, Ontario, Bloomington, Colton, San Bernardino, Redlands, Crafton, Highgrove, Riverside, Redlands Junction, Beaumont, Banning, Indio, Coachella, Thermal, Mecca, Browley, Imperial, El Cantro, Heber, Calexico.

"During all or a part of the time that the train is in southern California the following University representatives will accompany it: President Benj. Ide Wheeler; Prof. W. T. Clark, superintendent of university extension in agriculture; Mr. J. B. Neff of Anaheim, conductor of farmers' institutes for southern California; Prof. F. T. Boiletti, viticulture; Mr. R. E. Mansell, cover crops and truck gardening; Prof. C. M. Major, animal industry, and Prof. Ralph E. Smith, plant pathology. Other experts will be called on as the occasion may demand.

This plan has seemed so novel to Europeans that *The London Illustrated News* for February 6, 1909, devoted a full-page illustration to the subject, entitling it "A schoolhouse on wheels, or learning farming aboard a train." The following comment was made: "America's encouragement of agriculture: a lecture on scientific farming in a railroad carriage. Without some scientific knowledge the farmer of to-day can not expect to succeed. America, realizing this, is teaching those engaged in agricultural pursuits how they should follow their business. The first of several trains that are to be used as moving schoolhouses is now on the road. Lectures on farming are given and stoppages are made wherever it is thought necessary. Each talk lasts forty-five minutes and it is a fact worthy of notice that many women attend the courses."

NATIONAL ORGANIZATIONS.

The National Department of Agriculture.—Beside the above means of popular agricultural instruction in the United States there are many ways more common to the people at large in which agricultural knowledge is disseminated. Perhaps the most prominent of these different means of disseminating agricultural knowledge is through the work of the National Department of Agriculture, which includes the Weather Bureau,

Bureaus of Animal Industry, Plant Industry, Chemistry, Soils, Entomology, Biological Survey, Statistics, The Forest Service, Division of Publications, the Office of Experiment Stations, and the Office of Public Roads, and has through its various officials and employees, such as the directors of different kinds of agricultural work, experts, and lecturers, accomplished as much or more toward the progress of agriculture and the general improvement of the country than any other Bureau of the National Government. Mr. Roosevelt stated that he believed that the Department of Agriculture benefited the country more for the money invested than any other Department of the Government.

Demonstration farms.—A most interesting feature of the educational work organized by the United States Department of Agriculture is that which is carried on by means of the demonstration farms of the Department. These farms were started with the object of showing, by numerous practical examples over a large area, the advantages of improved methods of agriculture. The depredations of the Mexican cotton boll weevil, which threatened the entire destruction of the cotton crop in many districts, was one of the chief reasons which led to the starting of this work.

The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to instructions. This is visited by an agent once a month to see that these instructions are carried out, and to give further advice if necessary. The farmers who coöperate and give reports on results also agree to cultivate their crops according to instructions, but are not visited regularly by the agents.

State departments of agriculture.—In coöperation with the National Department of Agriculture are the State departments or boards of agriculture, which form an important part of the government of each State. Twenty-one of the States and Territories have commissioners of agriculture and twenty-nine of them have State boards of agriculture. In all of the States and Territories except Alaska, Hawaii, and Porto Rico advantage is taken of the provisions of the Acts of Congress of July 2, 1862, and August 30, 1890, providing for agricultural instruction. The number of these institutions is sixty-five. In twenty-one States the agricultural colleges are departments of the State universities. The total number of persons engaged in agricultural education and research at the land-grant colleges and experiment stations in 1907 was 6,243 and the number of students 66,193. The agricultural experiment stations are, with very few exceptions, departments of the agricultural colleges.

National commissions and organizations.—Some of the movements on the part of the National Government for the development of agriculture and the improvement of country life have been the meeting of the governors of all of the States in Washington for a conference with the President regarding matters which were of most concern for the development and promotion of the best interests of the people of the different States, the calling of the National Conservation Commission, and the

appointment of the Commission on Country Life by President Roosevelt. Beside these newly inaugurated movements there are many permanent organizations such as the Association of American Agricultural Colleges and Experiment Stations, American Association of Farmers' Institute Workers, American National Live Stock Association, National Wool Growers' Association, National Dairy Association, American Breeders' Association, forestry associations, schools of forestry, National Bee Keepers' Association, Farmers' National Congress, Patrons of Husbandry, and horticultural societies.

The Graduate School of Agriculture.—Other gatherings which were of no little importance and should not be overlooked were the sessions of the Graduate School of Agriculture. The third session was held at Ithaca and Geneva, N. Y., July 6 to 31, 1908. Dr. A. C. True, Director of the Agricultural Experiment Stations, United States Department of Agriculture, served as dean and Prof. G. N. Lauman, of the College of Agriculture of Cornell University, acted as registrar. This school was organized through the standing committee on graduate study of the Association of American Agricultural Colleges and Experiment Stations. During the sessions of the Graduate School meetings of the following organizations were held: American Society of Agronomy, Association of Dairy Instructors and Investigators, International Conference of Poultry Instructors and Investigators. It is estimated that at least 350 persons attended the sessions of the school. At the closing meeting Dr. True said: "Probably never before has there been gathered together for so extended a period so large and enthusiastic a body of scientific men interested in agriculture."

Farmers' unions.—Beside the above-mentioned meetings and conferences, which were of national importance, there are local, State, and national gatherings of the Patrons of Husbandry and other farmers' unions, which are organized in almost every State and, in fact, in almost every township, if not every town, in every county and State in the Union. The Patrons of Husbandry, or the Grange, while it claims to be a secret society, is organized solely for the promotion of the interests of the farmer and the improvement of the conditions which surround country life.

The farm press.—A very important factor in the line of agricultural instruction and coöperation, one which has only been started in the Philippine Islands, is the work of the agricultural press. In almost every State there are papers devoted to the particular agricultural interests of the various sections of the State, which materially assist the farmers who read them, and furnish a medium of communication between farmers of different sections, enabling them to better coöperate with one another and assist each other in the different lines of agricultural work which they are carrying on.

LOCAL ORGANIZATIONS.

Farmers' institutes.—Another means of popular agricultural instruction, which is voluntary on the part of the people in almost every large section or community, is the Farmers' Institute, which in most cases closely coöperates with the agricultural college and experiment stations of the State. These organizations of farmers hold meetings at least once or twice yearly, at which farmers from the different parts of a section discuss questions regarding the best methods of raising the crops in which they are interested and the best means for promoting their general interests at home and abroad. Through coöperation with the State department of agriculture or the State agricultural college these meetings are usually furnished with lecturers or instructors on those lines of agriculture in which the farmers of the particular section are most interested. On the other hand, through the work of the State agricultural colleges or experiment stations in many States, the farmers who have organized themselves into institutes, associations, or unions are induced to visit the State agricultural college and experiment station at least once during the year, at which time the lines of work which are being carried on at the college or station are explained to the farmers and such questions as are of most importance are dealt with in general discussions or conferences which the farmers are invited to attend and participate in. Such excursions tend to bring the farmers into much closer sympathy and communication with the agricultural college and the experiment stations of their State. In many cases there is very close sympathy and coöperation on the part of the farmers with the colleges and experiment stations and many questions of importance to the farmers are immediately referred to the college or experiment station where they are taken up, investigated, and answered to the satisfaction of the individual farmer.

State and county fairs.—Another source of agricultural information and instruction, which should not be neglected, is what is popularly known as State and county fairs. At these fairs, which are often held in the smaller sections of the States, the products of the farms from the country around are exhibited and various money prizes, awards, medals, premiums, etc., are given for excellence or superiority of the different products. In some States almost every county has a county fair and later on, in most States, a State fair and agricultural exposition is held. Before these fairs the farmers vie with one another endeavoring to raise the best products on their farms, and as a consequence of their desire to excel there is a natural demand for further information regarding the best means of raising the different crops and of breeding the best farm animals. In this way many of them are brought into communication with the State colleges and experiment stations which are organized for the promotion of the best interests of the farmers and the advancement of life in the country.

THE FARMERS' SCHOOLS.

The work of the common school.—Another source of popular agricultural instruction and one which has for a long time been neglected is the work of the schools for the farmers' children. Mr. John E. Bell, writing for *The Outlook* of April 10 last, says:

A little preliminary awakening is taking place along this line, but as a rule the farmers' teacher is not fitted by education, understanding, or inclination to teach the farmers' school. The farmer should be taught his business in his school; but what is the standing of agriculture in our country schools? Why, the average teacher of the farmer's school, it might be said, knows nothing about the nature of farming, cares nothing, dislikes the farm, and is teaching as a step toward getting away from the farm. When the teacher of the farmer's boy wishes to incite him to study and effort, wishes to create an ambition, he tells the boy that if he studies hard and learns well he may some day be a clerk in a store, or a bookkeeper, and tells the girl that she may become a stenographer and typewriter.

The following table is compiled from the United States Census for 1900 and the Census of the Philippine Islands for 1903.

The total number of persons engaged in gainful occupations in the United States is placed at 29,286,000, or 36.3 per cent, in the Philippine Islands 3,037,880, or 43.5 per cent, classified as follows:

	United States.		Philippine Islands (per cent).
	Number.	Per cent.	
Agricultural pursuits.....	10,438,000	35.7	41.3
Manufacturing and mechanical pursuits.....	7,113,000	24.4	31.6
Domestic and personal service.....	5,691,000	19.2	18.87
Trade and transportation.....	4,778,000	16.4	7.5
Professional service.....	1,264,000	4.3	0.8

It has been recognized for some years past that the course of study for the common schools is made up solely for the purpose of preparing the children in the schools for advanced training in high schools, academies, and colleges. Our schoolbooks have been prepared on the science basis and the literary basis, and with scientific or academic objects in view, to such an extent that we have had science readers and stepping-stones to literature as the substance of reading matter for the boys and girls in the country schools for more than a decade. While the courses of study for practically all of our schools in the United States and the Philippine Islands have been made upon the basis of preparing for advanced scientific, literary, or classical education, it is a recognized fact that not to exceed 10 per cent of the boys and girls are ever able to take advantage of such advanced training or education, and the remaining 90 per cent, who must follow agricultural, manufacturing, and mechanical pursuits, trade and transportation, domestic or personal service, receive no consideration whatever in the course of study or the work of the common schools. In short, the whole purpose and plan

of our educational system is solely for the benefit of the well-to-do 10 per cent of the population who may enjoy the opportunity of advanced training in high schools, academies, colleges, and possibly universities.

It would seem that the teachers of our common schools, more particularly the country schools, should be prepared to instruct the boys and girls in those subjects and along those lines of learning which they need for their future life work, instead of training them along literary, scientific, or classical lines, as is the case at present both here and in the United States.

It would seem that, in the country schools at least, the farmers' daughters should be taught—without books—something of home economy, of the value of different foods and the best methods of preparing them, the elements of sewing, in short a better knowledge of domestic science and art than they obtain at home. It would seem that in the country school the teacher should be qualified to train—without books—the boys and girls of the country in the fundamentals of such subjects as the following:

- (1) The nature and value of different soils.
- (2) The selection of seed.
- (3) Methods of seed testing.
- (4) The planting of trees.
- (5) The practice and principles of pruning.
- (6) The practice and principles of grafting.
- (7) How to start home fruit gardens.
- (8) The treatment of the common plants, fruits, and grains for the prevention of common diseases.
- (9) The nature of common animal diseases and how to treat them.
- (10) The elements of drainage.
- (11) The elements of irrigation.
- (12) The making of plans for school gardens.
- (13) Plans for the improvement and beautifying of home and school grounds. A better knowledge of these things by the boys and girls of the country means a higher standard of living and life for the country and the nation, and a higher working efficiency of the individual citizen.

Along this line many popular books have been produced in the United States, among the foremost are "Among Country Schools" by O. J. Kern, several books by Prof. L. H. Bailey, of the Agricultural College for Cornell University, the reports of the United States Commissioner of Education and the National Educational Association. These reports contain accounts of the school garden movement and the move for agricultural education in country schools in Germany, Prussia, France, Holland, Sweden, and Russia.

SCHOOL MOVEMENTS.

While the work of our country schools has been solely for those who could afford to go to high schools, colleges, and universities, those who choose the farms and the country for their life work—those who, according to Mr. Roosevelt, stand for what is fundamentally best and most needed in our American life—are left to get what they can from the schools, and statistics show that 90 per cent of them drop out, never take this advanced training, or finish a course. As Mr. Bell has said the farm and the farmer is despised in the farmer's school by his teacher, and eventually by his own children. Recently there has been a tendency on the part of some educators to consider this neglected 90 per cent, the boys and girls of the farmer and working man, who pays for the school. In some States the courses of study have been changed so as to train for the business of the farm and the country, to enhance the value of country life, to beautify and make farm homes attractive.

Farmer boys' experiment clubs.—One of the more important movements in the schools for arousing an interest in the business of the farm and a desire for agricultural knowledge is the farmer boys' experiment clubs, which in some cases number as many as 500 boys between 9 and 21 years of age. In these clubs the boys test the vitality of different seeds, make investigations with reference to diseases of plants and animals raised on the farm, experiment with sugar beets and green corn, and in some cases corn-growing contests have been held.

Girls' home culture clubs.—Side by side with the boys' experiment clubs, home culture clubs are being organized for girls, in which the girls have general cooking contests, bread-making contests, and needle-work contests. Through these clubs almost unbounded interest has been aroused in the work of the home and the farm, the everyday life of the boys and girls is made much more attractive, and country life takes on a new meaning. Beside the advantage of turning the minds of our young men and women to the improvement of country life, there is not that discontent which comes from educating them to ideals they can never realize and leaving them untrained and unprepared for the service they must perform.

Educational excursions.—In addition to the organization and the contests of the boys' experiment clubs and the girls' home culture clubs, many educational excursions are planned and made by them to State agricultural colleges, State universities, or State capitals, and thus a knowledge is obtained at first hand of the direction and the results of the different lines of government work, of commercial and social conditions outside of the little community in which they usually live.

HAWAII'S ANNUAL POULTRY EXHIBITION.¹

The annual exhibition of the Hawaiian Poultry Association took place in the National Guard rifle gallery, Honolulu, on Thursday, January 14, 15, and 16 and two succeeding days. The collection of birds was a very satisfactory one and maintained the high standard of quality of former exhibitions. In addition to the poultry display, agricultural exhibitions were made by the Hawaii experiment station and by the board of agriculture and forestry, although it is to be regretted that it was found impracticable to include the general agricultural competitive display which has formed a part of some former exhibitions.

POULTRY EXHIBIT.

As heretofore the Plymouth Rocks were very conspicuous, not only in numbers but in quality. Dr. C. M. Cooke's display in this class was particularly effective. White Plymouth Rocks and Orpingtons showed an increase of popularity, while an entirely new bird was seen in the Rhode Island Whites exhibited by Messrs. J. Johnson and J. Andrade. The pens of Leghorns, Wyandottes, and Rhode Island Reds also contained many handsome birds. Among the prize winners in the domestic class, the following names were of frequent occurrence: Mrs. S. I. Shaw, Messrs. J. J. Greene, C. M. Cooke, jr., J. F. G. Stokes, L. C. Ables, R. C. Brown, J. Cullen, F. Santos, and Dr. C. B. High.

More specimens of the ornamental breeds were in evidence than in former years: Frizzles, Silkeys, and Black Polish being represented with creditable birds.

Among the pigeons the most handsome birds were probably the Jacobins and Pouters, and although the display was not large, the general quality of the birds in this section of the exhibit was distinctly good. The awards were made by Mr. G. R. Andrews, of Fresno, California, who visited the islands for this purpose.

HAWAII EXPERIMENT STATION EXHIBIT.

The Hawaii Federal experiment station displayed a very effective exhibit. Prominence was given to cotton, which is at present causing so much attention locally as a prospective Hawaiian crop. Tobacco and rubber were also given recognition, which crops together with cotton well represent the potential agricultural energy of the Territory which the station is doing so much to develop.

¹ From the Hawaiian Forester and Agriculturist, Vol. VI, No. 2, February, 1909.

One feature of the display was particularly satisfactory to the forester, for it represents in concrete form the efforts which are being made to develop our own resources and to make our islands independent of other sources of supply. The specimens of bales of rice hay and rice straw are alluded to—the former especially being of such quality as to encourage the hope that it will eventually command much of the local demand.

A house constructed of beeswax, together with an observation hive in operation, and specimens of bee products represented the local honey industry.

BUREAU OF FORESTRY EXHIBIT.

The bureau of agriculture and forestry was well represented by a display from each of its divisions. Of these the one attracting special attention was the entomological exhibit. It is satisfactory to note from year to year the increasing interest which is being given to this phase of economic agriculture—a result no doubt due not only to the vital part which insect problems play in our local industries, but in particular to the judicious policy of education which is carried out by the division.

The collection shown by the division of forestry well displayed the progress of conservation throughout the islands and epitomized the multifarious work which falls to the lot of this division.

LECTURES.

An agreeable innovation was made by the lectures of Prof. B. E. Porter, of the College of Hawaii, on Thursday and Friday evenings. These included the selection and care of poultry and were illustrated by lantern slides.

POULTRY RAISING IN HAWAII.¹

Poultry culture has many peculiar and particular attractions to old and young. A fine flock of well-kept fowls is certainly a very great pleasure as well as a source of income to the family. And the care of poultry offers ample opportunity for the abundant exercise of both brains and muscles by men and women of almost all conditions of life.

Whenever poultry is kept, it is with a definite purpose in mind. Such a purpose may be for pleasure or profit, or both. Many families keep a few fowls to use up the waste food materials about the home, furnish fresh eggs, beautify home surroundings, or provide recreation to the head of the family when he comes home from professional duties. Then besides all this pleasure the profit which can be derived is no mean item for any family to consider at the present time.

When poultry is kept for profit alone this situation changes. Then it is more serious business, for so many problems confront the poultryman. Some will immediately say, "What must I do to insure a reasonable amount of success?" The answer is, study and work.

¹ By B. E. Porter, Professor of Animal Husbandry, College of Hawaii.

There could certainly be no more favorable conditions for poultry keeping than we have here within our own midst. In fact some men are frank enough to say that things are almost too favorable, so that people do not take the necessary precautions and care for their fowls. It is true that some grain foods are high, but market prices to the Army and Navy, together with the advance in prices of meats, make the opportunity for successful poultry keeping so much more promising.

Statistics are dry things, but sometimes they show results that are a revelation to the uninitiated. According to the bureau of statistics, the value for the import of eggs alone has been for 1906, \$12,995; 1907, \$14,943, and 1908, \$16,511. These figures show an increase of almost \$2,000 each year. For a young man with enterprise and push such figures look particularly inviting, for there is a possibility that he can have a goodly share of such money as returns on his business.

At best, poultry raising can not be carried on in a haphazard sort of way or because a neighbor makes \$10 a week with fowls. To make a profit on poultry, as in any other line of successful business endeavor, the personal equation must be solved. An inventory of personal habits and characteristics is essential.

QUALIFICATIONS OF A POULTRYMAN.

In order that this taking account of stock may be thorough and quite complete, let us consider what these qualities may include.

First of all he must have a particular liking for animal life and, you may say, a love for good, lively, healthy looking birds. He needs the qualities of the brightest merchant. To be successful he should be sagacious and shrewd, capable of planning well and executing completely.

To get along well he must have a system developed in all its details, and be regular in his habits. The crowning characteristic is the quality termed "common sense." Then, again, he must be a student of market requirements, tireless in his attempts to satisfy a market with high quality poultry products put up in attractive packages. He should be a student of principles of breeding, methods of improvement, and factors of feeding and never be self-conceited, which limits progress.

Let the poultryman decide to make poultry his life study, using the instruction gained, profiting by the experience of other poultrymen, acquiring wisdom from his own successes and failures, and always welcoming any new practical ideas which will help on his poultry progress.

LOCATION OF POULTRY YARDS.

For the beginner, the location of yards or the amount of land which can be utilized for poultry must receive attention first. It does not take much room for a small flock, but chickens do best with plenty of range. Some of the mainland experiment-station workers have found that a four months' chick on fresh range would equal in weight a five months'

chick on the old range. A place with some sand in the soil is preferred for the reason that it allows more perfect drainage in wet weather.

The necessary buildings for the beginner, in this climate, need not be very expensive. The principal thing in building, however, will be protection against wind, rain, dampness, rats, and other pests. Trees and hedges can be made to afford protection from the sun if the hens and little chicks so desire. It is also, quite often, desirable to screen in the roosting quarters so that the hens may be free from annoying mosquitoes at night.

SELECTING STOCK.

When commencing poultry raising it is advisable to select stock for a particular line of production. Let the stock be noted for egg production or fancy broilers. The market is good for both kinds of birds. Do not have dual-purpose fowls. Have specialists; then the breeding and feeding are more easily solved.

For egg production, select breeds from the Mediterranean class, and for broilers choose an American or Asiatic variety. An American or Asiatic fowl may lay as many eggs as the lighter breeds, but when results are totaled the economy of production is usually in favor of the smaller hen, because her cost of maintenance is less.

To have a flock of good laying hens, special attention must be given to their selection. If possible, get pullets from breeders who are reliable and are known to have good birds.

Ordinary fowls may do until the flock can be replaced by others from a breeding flock which has been selected with special care.

The inexperienced poultryman will find that breeders recognize that a laying hen has a particular type and form closely correlated with egg production. A laying hen is not fat. She has a red comb, a clear eye and a hearty appetite. In form she has a long body, wide in the breast for a large craw, flat and wide in the back and is not heavy in the region of the fluff.

The male bird for the breeding flock should not be anything but the best. A knowledge of the laws of breeding will help the beginner to understand why good prices are asked and received for superior stock.

After the buildings are built and the fowls put in the yard, real work begins. Care must be given to the feeding so that the hens will not get overly fat and cease laying.

Vermin and disease must be kept off the fowls. Water, grit, and shell-forming materials are needed. Records should be kept so that the poor-laying hens can be removed from the flock. Trap nests are valuable for such work. Many who were at the recent poultry show remember the model presented by the College of Hawaii.

The recent exhibition was a decided help. There breeders brought together the results of their best efforts, which were, indeed, highly commendable. The fowls exhibited showed high quality and gave evidence

that some masters in the art of breeding and conditioning stock had been at work. Their work fully demonstrated the fact that they were close students of superior fowls and the Standard of Perfection, which, by the way, should be in the hands of every breeder.

Poultry culture is a vocation which gives ample opportunity for the deepest study, unlimited play for the best talents, and abundant room for the most skillful practice. The poultryman of to-day, who is equipped with a natural inclination for the calling, interested in the industry, trained in all the care and management of the fowls, especially educated for the business and not afraid to work hard with both brain and brawn, is prepared to act with intelligence and may become not only a successful breeder of thoroughbred poultry and producer of high-class poultry products, but also a public benefactor and an honor to his State and country.

FOUR YEARS' EXPERIENCE GROWING RUBBER TREES ON BASILAN.

By CARL F. MILLER.

The samples sent to the Bureau of Agriculture are the product of the Ceara rubber tree (*Manihot glaziovii*). There are in Basilan three rubber plantations, Dr. J. W. Strong's, the San Rafael agricultural farm, and my own. In my district there are, outside of my plantation, a few trees planted by natives around their houses, more for curiosity than for commercial purposes. The trees from which I tapped the rubber for the samples were planted and cultivated by me personally and at the time of tapping were 3 years and 6 months old. These trees were grown from imported seeds and planted at stake in newly cleared forest land of a rich clay loam. Hemp and rice were planted at the same time as secondary crops.

On my plantation I set out 1,000 seeds; the seeds were previously filed to facilitate quick and uniform germination, and incidentally it gave the ants and other vermin of the ground a chance to eat the kernels before germination could take place, causing a loss of at least 50 per cent of the seeds. The weeding which was necessary for the cultivation of the rice and hemp caused the loss of many young rubber plants which at that time were about 6 or 8 inches high, being between rice and weeds made them rather difficult to detect. The result was that many of them were pulled up with the weeds or smothered by having weeds thrown on top of them. This latter loss could have been avoided by placing a stake at each place where I planted a seed. Out of the 1,000 Ceara rubber seeds planted only a little over 100 trees were raised, due mostly to inexperience in the beginning.

GERMINATION.

The seeds may be planted without filing, in which case the ants can not destroy them, but if not filed they will take from three to six months for germinating; if under moisture and heat they will germinate sooner, but at best germination will be uncertain and not at all uniform, so that planting the seeds unfiled may be considered a failure in the beginning.

The nursery.—In this case we will have to resort to a nursery in which to sprout the filed seeds and transplant them to the field afterwards;

this may be done more or less successfully, but with the best of success it leaves a lot to be desired. It is no end of trouble to clear a large plot of land and free it from ants and insects; even if perfectly free from ants, they will get in before the seeds can germinate and destroy a large percentage of them. The subsequent removing and transplanting of the seedlings from the nursery to the field is simple enough; any native can do it with fair success so far as the living of the seedlings is concerned, because the Ceara rubber seedlings are very hardy and stand transplanting fairly well, but that is not all; the most important point is to get the roots placed in their proper position, the reason for this I will explain.

The young plants in the nursery make their first appearance above ground in the same manner as the coffee bean, or any other bean for that matter; that is, the seed is borne up, the kernel makes the first two primitive leaves, but the root system seems out of proportion in comparison with the size of the young plants. On examining seeds in the nursery you will find that before the seeds ever make their appearance above ground they have developed roots from three to five in number with a taproot very long and delicate that seems to be inclined to go right to the bottom if the bottom is to be found.

Transplanting.—So you can see that by the time the plants are old enough to stand transplanting, which is about ten to fourteen days with their rapid growth, they have large but delicate roots, and as for taking them up with sufficient soil adhering to the roots so as not to cause injury, it is practically impossible, unless the seeds have been given plenty of distance, and the soil is of the right consistency; even then, the subsequent handling of the plants in transplanting will invariably remove it, so that the roots will be bare. Here is where the important point above-mentioned comes in; that is, to get the taproot straight down, and the side roots equally divided on all sides. On examination of newly transplanted seedlings you will probably find that the taproot instead of being straight down is doubled up or pointing upward, and the side roots instead of being equally divided are all on one side and in all sorts of shapes and forms; all this may seem of little importance to the causal observer, who is apt to say "What is the difference which way the roots are placed if the tree grows all right?" and he may be right so far as other kinds of trees are concerned, but in the case of Ceara rubber it is of the utmost importance that the roots be in their proper position. The results from lack of attention to this item when transplanting are sure to manifest themselves sooner or later.

It is a well-known fact that Ceara rubber is a very shallow feeder and a poor resister of winds. The wood is hard and brittle and a heavy wind will splinter it all to pieces, sometimes the whole top will snap off, leaving a bare stump standing; and after a heavy rain, when the ground is loose, a light wind will often push the tree over, pulling it out roots and all;

trees that have the roots all on one side will invariably fall over under their own weight.

I have seen very fine, large, and otherwise apparently flourishing trees down after a heavy rain, and for no other reason except that all the roots were on one side, and the taproot, instead of being straight, was curled into a sort of spiral and had no holding power at all. It may seem strange, but it is a fact that the Ceara rubber tree does not grow any new roots as it grows older and larger, with the exception of small feeding roots which branch from the main roots. There is absolutely no duplication of the main roots, so that if a seedling is planted with the roots badly placed it will always remain a badly rooted tree. From these facts it may be seen that it is important to have the roots properly placed when transplanting rubber trees.

A method of germinating.—I have tried various ways of sprouting the seeds before planting them in their permanent place in the field. The best results were obtained in the following manner:

Select a moist but not too wet spot in the field where the rubber seeds are to be planted, dig a hole about 3 or 4 feet in diameter and about 2 feet deep, take out all of the dirt and make the bottom smooth, then scatter about 1 inch of dirt evenly over the bottom, take the rubber seeds and scatter them thickly all over the loose dirt in the hole, then take a basket or a box with a perforated bottom and place it over the seeds bottom up, take an empty sack and place this over the basket or box, whichever the case may be; when this has been done cover the basket or box with the dirt that was taken out of the hole so that there is about 12 inches of dirt all over and around the basket. The seeds must be filed, and it is a good plan to soak them in water for about twenty-four hours before sowing them in the hole.

After three days uncover the basket or box, being careful to remove all dirt before taking the basket or box away. You will find that a large percentage of the seeds have sprouted; that is, the sprouts are just coming through the seeds, some of them may have already taken root. You can then pick out all those that have sprouted and plant them in their permanent place in the field; the ants will not harm them after they have reached this stage. The seeds that have not sprouted must be covered up again, and after twenty-four hours repeat the operation, and so on until all of the seeds have been planted. The field should be previously prepared, the hole should be dug, that is, the soil should be loosened up 3 or 4 inches deep, and a stick placed at each hole where the seeds are to be planted. The planting of the sprouted seeds is very simple. Make a hole about 1 inch deep in the loosened earth, put the seed in with the sprout down, cover lightly, being careful not to step on or press down on the newly planted seed with your hand, the first rain will do that much better and without injury to the sprout.

If the above-described method of sprouting and planting the seeds is followed, three or four men can plant a large field in a day, and every seed will grow. The result will be a field of uniform and well-rooted trees, which is exactly the opposite of what might be expected from seedlings grown in a nursery.

PLANTING CUTTINGS.

Plantings may be made from cuttings and sometimes they will make fine trees; but as for planting a field from cuttings, it is not advisable, for a large percentage of the cuttings will not make anything worth calling a tree.

PLANTING YOUNG SHOOTS.

Select a tree that has branched very low from the ground but is otherwise in good shape and growing vigorously, prune out the whole top; that is, cut out everything except the primary and secondary branches, leaving no branch that is not at least 2 inches in diameter, because shoots from small branches will not amount to anything. A tree that has been treated in this manner will in a few days send out strong and vigorously growing shoots all around the edge of the cut-off branches. When these shoots are about 8 or 10 inches long, they are then ready for planting. Do not break them off, but remove them from the tree by cutting; care should be taken to leave a little of the bark and wood from the tree attached to the shoots. These shoots are very tender and should be given shade for a few days; they will take root very quickly, and after they are once started will grow vigorously, growing even faster than trees grown from seeds.

PRUNING.

It has been stated that on rich soil the Ceara rubber tree makes a very heavy top and that it is a good idea to prune it rather severely. My own experience with pruning has been both instructive and suggestive. I firmly believe that pruning does other things to the trees beside saving them from being blown to pieces by heavy winds.

As I have said before, it is a well-known fact that Ceara rubber is a poor resister against heavy winds, and if not protected or planted in a locality where wind storms do not prevail, or can not do much damage, they will be splintered, or very severe damage may be the result of a storm. But to effectively prune a large number of trees is not easily accomplished, and I believe the results of severe pruning manifest themselves along other lines later on. I will state my reason for this.

When my first trees were about eighteen months old they were in just this top-heavy condition; although well protected by surrounding forest I thought it best to cut out some of the branches of the most vigorously growing trees. To do this I had to use a stepladder, most of the trees being big and strong enough to allow me to stand in the forks to do the cutting; but I soon found that I had to do the cutting from below the branches

because cutting from above would result in splitting, often one light cut from a bolo would cause a branch to sag and split down the branch of the main trunk. I tried cutting from below by standing on the ladder; cutting half through a branch from below with a small cut from the side would generally result in a clean break off.

After treating some twenty trees in this manner, I decided to let the rest of them take their chances with the winds, because in doing this cutting from below, latex would trickle from every cut and run down my neck, arms, and all over me, and everything I came in contact with would stick to me; so I promptly decided that the rest of the trees did not need any pruning.

The next time I paid any special attention to these trees was at the time of tapping, when they were $3\frac{1}{2}$ years old. The first day of the tapping I noticed a marked difference in the quantity of latex produced by individual trees; upon looking into the matter I found that I had most of the pruned trees included in the fifty trees that I had selected for tapping. During the period that I carried on the tapping I discovered that every tree that had been pruned gave rather below the average amount of latex and the bark of these trees was below the average in thickness, although at the time of the pruning they were the largest; they were not above the average size and had not kept up with the other trees.

The trees that gave the most rubber were only about 8 inches in diameter with a trunk of 6 or 8 feet to the first branches, of a conspicuous appearance, with a very large spreading crown. The outer bark as well as the rubber bark is of a yellowish color, the latex also is of a yellowish color and the trees have a rubber bark that is considerably above the average in thickness. Although the trees are of the same species, they are probably of a different variety.

The trees which gave the smallest amount of rubber were about 12 inches in diameter with a very fine, smooth trunk of from 10 to 14 feet to the first branches; the rubber bark of these trees was very thin and the latex was of rather a watery consistency and would flow for only a short time. I was rather disappointed in these trees, because I had anticipated rather the opposite results.

TAPPING.

I first prepared fifty trees for tapping; the preparation consisted in removing the outer bark from the trees as high as I could reach from the ground, which is about 8 feet, with the exception of a few trees whose first branches were below 8 feet, but most of them began branching at from 10 to 14 feet from the ground. The outer bark removed and the receptacles and drip cups having been prepared for use the night before, the trees were ready for tapping the next morning. The receptacles used were ordinary Chinese tea bowls holding about half a pint

of latex, the drip cups were zinc cups about half the size of the ordinary condensed-milk can.

I commenced tapping about 6 o'clock in the morning and finished tapping fifty trees about 10 o'clock. I used the herring-bone system which consists of a vertical cut from as high as I could reach from the ground to about 6 inches from the base of the tree, with side cuts about 10 inches apart at a slant so as to afford free running of the latex into the perpendicular cut, where the ammoniated water from the drip cup carried it down into the receptacle at the base of the tree. The tools used were a pair of Ceara tapping knives, one for right and one for left laterals.

When ready to begin tapping, place the receptacle at the base of the tree; take a piece of tin about 3 inches long and one-half inch in width which has both edges bent up to give it a sort of gutter shape, shove this tin into the inner bark of the tree a little above and with an easy slant down into the receptacle; then take one of the knives and begin immediately above the tin gutter and make the perpendicular cut about breast-high, then reverse the knife and begin at the top and cut down, leading into the cut already made; place a drip cup at the top, immediately above this perpendicular cut, and pour into the drip cup a solution of about one-half of 1 per cent of ammoniated water. After this has been done, make the side cuts or laterals leading into the perpendicular cut. The drip cups have a little hook on the upper edge for hooking them into the bark of the tree, they also have a little round hole in the bottom in which is placed a wicker so as to give a slow but constant drip. The opening of each tree requires only a very few moments; it took me about thirty minutes to open the fifty trees.

Too deep cutting.—The Ceylon Ceara tapping knives work fairly well but are dangerous in the hands of inexperienced and careless laborers. Great care should be used not to cut too deep; if the cambium bark is cut through, the healing of the wounds will be slow and will not be smooth, but will give the tree a ridged appearance, and besides it is liable to cause inconvenience in later tapping. Too deep cutting exposes the tree to insects, which, if not attended to in time, will cause the tree to decay and finally die. I have trees that were cut too deep which were attacked by borers, apparently the same kind that bores into any kind of wood, but the trees do not seem to suffer any damage from these borers, the rubber bark heals up and closes in so as to exclude the insects. There is, however, an insect that attacks the trees that have the wood exposed from too deep cutting or have been otherwise injured; this is a very formidable grub that undermines and apparently eats up the rubber bark. I believe it is caused by a moth which deposits its eggs under the bark on the edges of the wounds.

After all the trees were opened up, I went from tree to tree to see

that the drip cups were properly dripping, which is very important and must be given close attention. If for any reason the flow of ammoniated water from the drip cup stops, the latex in the receptacle at the base of the tree will coagulate almost immediately and the flow of latex from the tree will be stopped because the latex coagulates in the horizontal cuts if there is not sufficient flow of ammoniated water to carry it along. Some of the cups may drip too freely and run dry before the latex stops flowing from the tree; all this must be avoided because any rubber which coagulates in the receptacles or on the tree can not be included in the final coagulation and therefore is not purified and can be sold only as scrap. After about one hour the flow of latex stopped, when we began the collection of the latex. For this I used ordinary water buckets, going from tree to tree pouring the contents of the receptacles into the buckets and carrying it to the house. After the collection the coagulation begins, which I did in the following manner.

COAGULATION.

First pour the latex through a strainer to take out all impurities, such as bits of bark, insects, etc.; then pour the latex into tin basins and mix it with a solution of acetic acid—care must be taken to use only sufficient acid to counteract the ammonia which was used during the tapping—too much acid will cause instant coagulation and the rubber will be in lumps or something like our milk and not at all uniform.

THE PRODUCT.

In from three to four hours the latex will have fully coagulated, when the water, ammonia, and acid can be poured off, leaving one solid mass of spongy milk-white rubber, which by pressure with the hands will expel most of the remaining fluid. When reduced to about one-half inch in thickness I put it through an ordinary clothes wringer to expel the remaining water and to give it uniform size. The resulting cakes were then placed in the shade where the hot air could dry them. When perfectly dry these milk-white cakes turned to a beautiful amber color, almost transparent. In this form the product may be put on the market, although on modern rubber plantations these cakes or biscuits are worked over and pressed into blocks before putting them on the market.

Inasmuch as this tapping was only experimental, and as I did not care to drain the trees by unnecessary tapping, this work was continued for only three days; that is, I tapped the same fifty trees for three successive mornings. The amount of dry rubber obtained during that time was 5 pounds, which was almost dry when weighed, with the exception of some of the last cakes or biscuits. However, no allowance was made for the loss of rubber occasioned by the scrap, of which there was considerable, owing in most cases to coagulation of the latex in the receptacles. As

this scrap could not be included in the final process of coagulation, and therefore is not included in the 5 pounds, I believe that if it had been included it would more than make up for the moisture in the last cakes or biscuits.

Summing up the results, we have 5 pounds of rubber from fifty trees, each tapped three times, which gives us an average of a little over one-half an ounce to the tree for each tapping, or, in other words, the fifty trees gave a little over 26 ounces daily. Supposing the tapping had been carried on for twenty days, this would have given us 10 ounces of rubber for each tree. It is claimed that the flow of latex increases considerably after five or six days, when a proper flow toward the cuts has been established, so that 10 ounces per tree ought to be obtainable. But let us be on the safe side and put the amount at one-half pound per tree—surely the results obtained will guarantee that amount. From this it may be seen that at the present price of rubber a plantation of 100,000 trees would give a good profit to the owner, and that is from trees only $3\frac{1}{2}$ years old; these same trees at 5 or 6 years of age may reasonably be expected to yield between 1 and 2 pounds per tree yearly, and I am certain that some individual trees will go above that amount.

SOILS.

The Ceara rubber tree is said to be a great drought resister and will grow on almost any kind of soil. In Brazil where the trees were probably first found, and in the dry Province of Ceara, Ceara trees are said to flourish on a sandy and rocky soil with very little rain. This, however, does not mean that the tree will not thrive on a rich soil with plenty of rain. Experiments made here on Basilan and at other places in the Moro Province go to prove that on a rich soil, with plenty of rain, the trees will grow to be from 8 to 12 inches in diameter in three years, and will produce a large amount of rubber of excellent quality. It is generally claimed that a well-drained soil is essential to the welfare of Ceara rubber. I do not believe that it would grow in swamps, but I do know that it will get along nicely on perfectly flat land with very poor drainage. I have on my plantation a number of 2-year-old trees which I planted on well-plowed land on which hemp was planted at the same time. One end of this plot of land has very poor drainage; the water of the rainy season will stand there at times from two weeks to a month, and the soil will be so loose that it will not stand walking on without sinking down to the ankle. The hemp on this piece of land never did thrive well and most of it has died out altogether. I also planted a few Para rubber seedlings on this land, and although they are growing they are nothing in comparison to the others that I planted on higher and well-drained ground, but the Ceara rubber trees on this wet lowland are flourishing and do not seem to mind having wet feet for a month at a time; in fact, some of

these trees are larger and better shaped than the parent trees from which I selected the seeds. I also planted a number of trees on well-plowed ground, leaving out the hemp, and instead planted corn for the intermediate crop. Two crops of corn were grown in between the rubber trees, but every one of those trees branched low and is otherwise stunted and deformed; this resulted from the cultivation of the corn, which was done with a one-horse cultivator. In going over the ground several times with the cultivator most of the surface roots of the rubber trees were either torn out or otherwise injured by the cultivator. Deep and well-plowed ground is favorable to very rapid growth, but the after-cultivation should not be done with draft implements, or at least deep-toothed implements should be avoided, because permanent injury to the tree will result from using them.

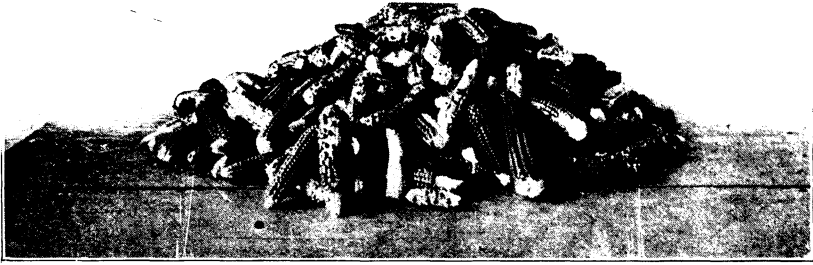
The rapid maturity of this variety in itself makes it the most desirable for experimental work, because it does not require from ten to fifteen years to find out whether you are working along the right lines or not. I also have several hundred Para rubber trees on my plantation; these are a part of some 20,000 seedlings which the Bureau of Forestry of Manila supplied to the government of the Moro Province. These plants were widely distributed and in most cases have made fine growth. Those on my plantation were planted among young hemp trees, and have made a very fine growth.

Para rubber seems to be just the thing for planting in between hemp, on account of the slower growth and high branching. The Para rubber tree is not likely to seriously harm the hemp for several years at least. On the other hand, the young plants seem to be benefited by the shade which the hemp affords, and the constant humidity of the soil in a hemp field seems to be just what the rubber desires, and the refuse from the hemp makes good manure for the rubber trees. In tapping the Ceara rubber I noticed that where the thoroughly decayed refuse was which resulted from the hemp stripper having been put up under the shade of the rubber trees, the trees gave more than double the amount of latex, which was of a much thicker or creamier consistence than that produced by the other trees. By going over the field and trying the trees which had been used for shade by the hemp stripper I found that every one of them produced a very free flow of heavy latex.

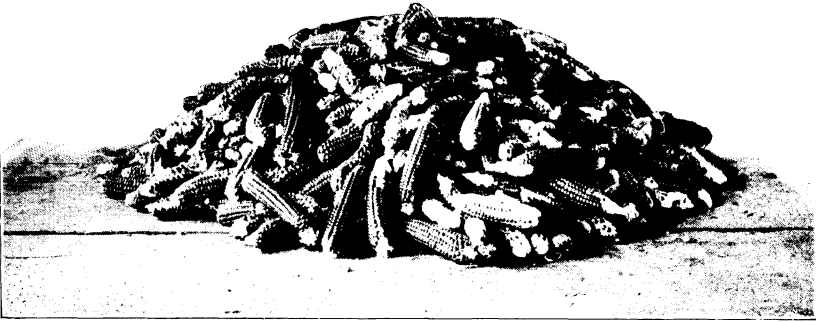
There are also a few *Castilloa* rubber trees on Basilan; the first were planted on the San Rafael agricultural farm in 1905 and although they were planted between sugar cane they have made a fine growth and are now fine, large trees.

The Moro Province has large tracts of the finest kind of virgin soil only a few miles from the coast, but the general conditions of a mountainous country with no roads make this place almost inaccessible and otherwise unsuitable for planting coconuts. In the case of rubber,

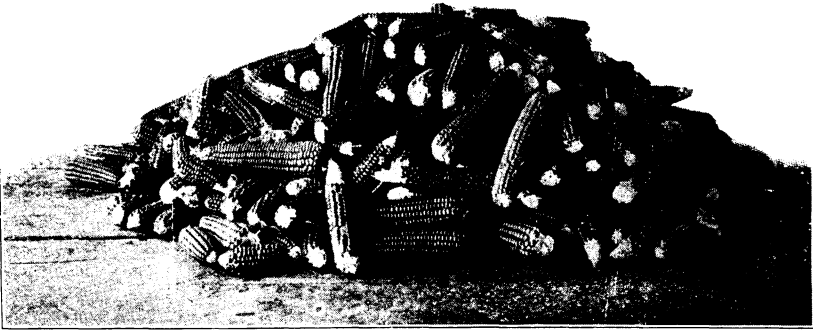
however, enough seeds to make a big plantation can be carried inland and the final product can, if necessary, be carried out in 25-pound lots; and then we are far ahead of the man that has to haul and handle tons of bulky stuff and receive only a small profit on it. The upland valleys of rich soil naturally protected by surrounding mountains are supplied with fine streams of water that afford irrigation almost for the asking. We have the finest coffee and cassava in the world growing almost wild. A plantation of Para rubber with coffee and cacao as an intermediate crop under irrigation would prove a very safe and profitable investment for capital if well managed.



Uncultivated rows one meter apart ($10\frac{1}{4}$ pounds).



Cultivated rows one-half meter apart ($69\frac{3}{4}$ pounds).



Cultivated rows one meter apart (99 pounds).

PLATE III.—THE RESULTS OF CULTIVATING MAIZE OR INDIAN CORN.

THE IMPORTANCE OF AGRICULTURAL EDUCATION FOR CAPIZ PROVINCE.¹

By R. L. CLUTE, *Agricultural Inspector.*

One of the most important questions that is before the people of Capiz Province is, "How can we make more money?"

When the railroad is completed we can travel to Dao, Dumarao, or to Iloilo with the greatest of comfort. The people who live along the line can easily exchange their farm products with Capiz or Iloilo merchants for farm machinery or store goods. Gravel and broken rock are being placed on our public highways. Permanent bridges are being built, good ferries established, and in a few years our public roads will be in excellent condition. The steamship service has been improved so that we now have several boats each month to Manila and to Iloilo. This transportation question that has been so difficult in the past is rapidly being solved. The railroads, the steamships, and the good public highways are all for the convenience of the people and indicate progress in civilization. We are on the road to prosperity, and if we all pull together success will be sure and permanent.

If you travel on the steamboat or on the railroad you must pay money. If you purchase food, books, clothing, or a cedula you must pay money. If you build churches, schoolhouses, or homes you must pay money. All of these are necessary for better living. In order, then, that we may make progress and enjoy more of the necessities and luxuries of life, how can we make more money? There is only one way to get an honest peso and that way is to work. We must work to advance in civilization.

If you travel in different parts of this province you will notice that the soil is covered with a luxuriant vegetation. This shows conclusively that this is a good place for plants. It is recognized by all that our great source of wealth must come from plants such as rice, sugar cane, tobacco, coconuts, etc. Our efforts then should be to produce them in larger quantities, for we can sell for cash all the sugar, rice, or tobacco that we can raise.

Plants grow according to certain laws of nature. If you wish them to grow rapidly and produce large crops, they must be supplied with a certain amount of food, water, air, and sunshine. A man who eats

¹ An address before the Capiz Agricultural Society, April 13, 1909.

too much or a man who eats too little can not work as well as a man who eats just enough. Just so with the plants. If they have too much food, water, sun, or air they do not grow well. The successful farmer knows just what plants want to grow well and gives it to them. We must dig the wild grass and shrubs from the fields and hills and plant sugar cane, rice, tobacco, etc. You say these plants are now being cultivated and that you know all about growing them. There has never yet lived a man who knows all about plant growth. New things about plants are being learned every day.

Three years ago, while teaching agriculture at the Philippine Normal School, the pupils and I conducted several experiments with corn. A field was thoroughly plowed and harrowed and divided off into six plats of equal size. The entire six plats were planted with ordinary yellow seed corn. The soil in one plat was not cultivated. The surface soil there became hard and the grass and weeds were allowed to grow between the rows of corn. In another plat the soil between the rows was hoed several times during the growing season. The grass and weeds there were all killed and the surface soil was made soft and fine. This plat produced 99 pounds of corn, while the plat that was not hoed produced only $10\frac{1}{4}$ pounds of corn. The boys with the hoe gained $88\frac{3}{4}$ pounds of corn. I have seen many fields of corn near Calivo and Malinao that were not cultivated. The weeds and grass were allowed to grow between the rows and the surface soil was allowed to become hard. Those farmers harvested a $10\frac{1}{4}$ pound crop of corn, while with proper cultivation the harvest might have been 99 pounds. The schoolboys learned from this experience that it pays to cultivate corn. Do not believe this because I say it is true, but try the experiment, if you are interested, and you will learn the *truth—for plants are always truthful*.

In another plat where the corn was planted in rows one-half meter apart the yield was $69\frac{3}{4}$ pounds and in another plat where the rows were 1 meter apart the yield was 99 pounds. Twenty-four and one-half pounds of corn were gained by having the rows a proper distance apart. A small crop of corn is secured if the plants are too close together. I have never tried the experiment with coconuts, but I believe that if they are planted too close together they, too, will produce a small crop. Coconut trees in Capiz Province are often planted 2, 4, or 6 meters apart. It is said by men of experience that these trees produce the largest number of nuts if planted 9 or 10 meters apart.

Is there anything to be learned about rice culture? One farmer at Naysud, a barrio of Ibajay, was afraid to have his carabaos inoculated with serum. Later his six carabaos died with rinderpest. His neighbor, who believes in serum and who has had his animals inoculated, now has carabaos to till his rice fields.

The farmer who cultivates his corn and sugar cane during the growing season will harvest a larger crop than the farmer who neglects this tillage.

The farmer who plants his coconuts 10 meters apart will probably harvest more fruit than the farmer who plants his coconuts 2, 4, or 6 meters apart. The farmer who believes in the value of serum can grow a larger crop of rice than the farmer who through ignorance allows all his carabaos to die.

A farmer who has learned by experiments how to grow large crops of rice, coconuts, tobacco, and corn can gain more money than the ignorant farmer. The intelligent farmers of Capiz Province and the best farmers of Europe and America are those who understand most about plant and animal growth. In Dr. Barrows's annual report he writes, "The hope of the common people lies either in possessing small farms or engaging successfully in lines of trade which will contribute generally to the commercial development of the Islands."

What is needed in Capiz Province is a large number of intelligent farmers in each barrio. With their assistance rinderpest could be suppressed and the crops of rice, sugar cane, tobacco, coconuts, etc., increased. How can we get these intelligent farmers in each barrio? There is only one way. Teach the boys and girls in our barrio schools how to live there successfully and contentedly. Agriculture should be taught in every school in this province. The last school report credits Capiz Province with 179 teachers and 19,000 pupils. These children are being taught the three R's and a certain amount of industrial work, but the imparting of agricultural knowledge is hardly started. I have traveled in nearly all parts of this province and have observed agricultural field instruction in only five schools. Simplicio Bitoon at Pilar and Agapito Protasio at Sigma have made excellent beginnings. Do the people in Capiz Province want practical agriculture taught in the schools? I have talked this matter over with nearly every president in the province, and with many leading people, and I have yet to find one who is not heartily in favor of agricultural instruction in every school. This study if properly introduced will not crowd out the regular studies, but will, on the contrary, be a help in making reading, geography, drawing, composition, and even arithmetic more interesting.

Since economic plants and domestic animals are the foundation for our prosperity, let us study them with a will. The carabao, the king of the rice paddy, should be protected from unnecessary sickness. Our horses and pigs and other domestic animals should be protected and improved. Let us educate a generation of farmers who will change the waste fields and hills of Capiz Province into a beautiful agricultural garden. Nature has done her part, the soil, the air, the water, the plants, and the animals are here. Just one thing is lacking—a large number of people in the barrios who have agricultural brains. These people can be had if practical agriculture is taught in our schools.

Let us ask the educational department if they will not establish practical agricultural education *in every school in Capiz Province*.

NOTES FROM OTHER FIELDS.

**COMPARATIVE TABLE OF CULTIVATED RUBBER EXPORTS FROM THE
FEDERATED MALAY STATES, 1908 AND 1909.¹**

Locality.	Exported during February, 1909 (pounds).	Previously (pounds).	Total exported during 1909 (pounds).	Export during similar period of previous year (pounds).	Increase (pounds).
Selangor* -----	60,249	52,727	112,976	71,241	41,735
Negri Sembilan -----	224,520	202,889	427,409	272,142	155,267
Pahang -----	76,656	89,977	166,633	125,012	41,621
Total -----	361,425	345,593	707,018	468,395	238,623

* Of the rubber exported from Selangor during February, 1909, 2,787 pounds were produced in Perak and 6,983 pounds in Negri Sembilan.

KUALA LUMPUR, *March 10, 1909.*

J. R. O. ALDWORTH,
Commissioner of Trade and Customs.

COFFEE AS A CATCH CROP WITH RUBBER.¹

GOLDEN HOPE STATE KLANG, *February 27, 1909.*

DEAR SIR: The following may be of some interest to your readers who may have planted coffee as a catch crop with rubber or planted rubber through old coffee plantations in alluvial soil.

The figures given show the result of the work for the year 1908 on this estate.

Area planted.	Planted with coffee (10 by 10).	Interplanted with Para rubber (30 by 15).	Yield of clean coffee per acre, 1908 (piculs).
30 acres -----	13 years ago -----	April, 1905 -----	5½
35 acres -----	do -----	do -----	3½
35 acres -----	do -----	do -----	5½
33 acres -----	do -----	do -----	6½
27 acres -----	12½ years ago -----	Not interplanted -----	10
152 acres -----	1 year, average -----	April, 1903 -----	1½

Your obedient servant,

EDMOND B. PRIOR.

PEANUT CULTIVATION IN BURMA.

A recent number of the Indian Trade Journal mentions that groundnut (peanut, *Arachis hypogaea*) cultivation has, of late, increased rapidly in Burma. For the year ending June 30, 1908, the total area planted with this crop reached 142,051 acres, compared with 78,743 acres in the

¹ From the Agricultural Bulletin of the Straits and Federated Malay States, Vol. VIII, No. 4, April, 1909.

previous season. In order to foster the industry, the Government is distributing seed nuts, which are repaid at harvest time.¹

COTTON-GROWING EXPERIMENTS IN THE HAWAIIAN ISLANDS.

A report from the Hawaiian Islands states that experiments are being made in cotton cultivation, the varieties under trial being the sea island, Caravonica, and Egyptian cottons. Breeding work has been started over an area of 5 acres, and 10 acres have been laid out for manurial trials with cotton planting; it is probable that the crop will be grown over an extensive area next season, since large numbers of applications for selected sea island and Caravonica cotton seed have been received at the experiment station.²

THE PRODUCTION OF SUGAR IN CUBA.²

Table showing the amount exported and on hand on March 31, 1909, compared with the figures for the same date in 1907 and 1908.

Locality.	1907.		1908.		1909.	
	Sacks.	Tons.	Sacks.	Tons.	Sacks.	Tons.
EXPORTED.						
Havana	453,426		311,828		370,814	
Matanzas	534,539		302,001		449,726	
Cardenas	464,284		432,149		509,446	
Cienfuegos	844,568		594,777		734,504	
Sagua	277,311		102,972		258,825	
Caibarién	229,516		206,617		244,314	
Guantánamo	180,324		135,527		198,613	
Cuba	38,931		26,392		31,500	
Manzanillo	237,859		187,569		231,431	
Santa Cruz del Sur	23,813		65,375		68,000	
Antilla	75,153		80,080		137,897	
Nipe Bay	45,264		48,480		121,008	
Nuevitas	92,305		71,761		80,921	
Júcaro			21,000		126,100	
Gibara y Puerto Padre	341,103		214,202		308,424	
Zaza						
Trinidad	44,928		28,482		42,500	
Total	3,883,324	554,760	2,829,212	404,173	3,914,023	559,146
ON HAND.						
Havana	675,309		456,530		543,307	
Matanzas	660,741		305,663		409,599	
Cardenas	595,978		310,526		490,503	
Cienfuegos	485,513		210,349		315,424	
Sagua	225,044		163,563		152,697	
Caibarién	218,083		117,518		167,604	
Guantánamo	100,654		61,770		99,488	
Cuba	10,104		17,627		17,130	
Manzanillo	15,023		10,800		63,509	
Santa Cruz del Sur	33,500		125		5,254	
Antilla	27,200		37,091		4,338	
Nipe Bay	7,600		10,715		23,868	
Nuevitas	33,140		27,130		20,005	
Júcaro			7,500		26,619	
Gibara y Puerto Padre	46,045		10,530		59,760	
Zaza	12,400		16,500		21,200	
Trinidad	3,189		9,111		7,588	
Total	3,149,523	449,932	1,773,048	253,292	2,427,983	346,855
Local consumption	1,017,192		672,405		922,351	
On hand, January 1 (old crop)			9,318			
Received until the 31st of March in the harbors	1,017,192		663,087		922,351	

¹ From the Agricultural News, Vol. VIII, No. 182, April 17, 1909.

² From El Hacendado Mexicano, Vol. VIII, No. 173, May 1, 1909.

THE CACAO MARKET OF THE PORTUGUESE ISLANDS.

According to the London Times, the well-known English firms of Messrs. Cadbury, Messrs. Fry, and Messrs. Rowntree have decided, after careful investigation of the matter, not to make any more purchases of cacao from the Portuguese islands of St. Thomé and Príncipe, on account of the slave-like labor conditions in those islands. West Indian cacao should therefore find a more extensive market in Great Britain.¹

THE DEMAND FOR ANNATTO SEED IN THE UNITED STATES.

In connection with the article by Prof. C. M. Conner, Assistant Director of Agriculture, on "The Annatto Plant" which was published in the December number of THE PHILIPPINE AGRICULTURAL REVIEW, we desire to call the attention of our readers to the following letter from Parke, Davis & Co., importers of drugs at 90, 92, and 94 Maiden Lane, New York:

NEW YORK, *January 14, 1909.*

Dr. G. E. NESOM,

Director of Agriculture,

Department of the Interior, Manila, P. I.

DEAR SIR: We are in receipt of your communication of the 23d of November, No. 7296A3, originally sent to our Chicago office and referred to us for attention, as all matters relative to the importation of crude material are handled by the importing department located at this point. In response we would say that you fortunately have addressed one who without doubt is the heaviest importer of Annatto seed in this country and we should be pleased indeed to receive from you a good-sized sample, say 8 ounces or so, which will demonstrate the quality that can be furnished from the Islands, stating at the same time the quantity that could be supplied, the lowest price c. and f. New York, and when shipment could be made. We also would be interested in having you advise us of the proper season for gathering this article in the Islands, as with this data in hand we see no reason, if the quality of the goods is satisfactory, why business of considerable moment could not be developed.

We thank you for your kind communication, and awaiting with interest your response, remain,

Yours, very truly,

PARKE, DAVIS & Co.

A similar letter from Chr. Hansen's Laboratory, Little Falls, New York, dated March 30, 1909, has been received by the honorable the Secretary of the Interior, and referred to this Bureau, from which we make the following extracts:

This article comes to this market from the West Indian Islands, especially from Jamaica and Porto Rico, where the crop ripens during the months of January, February, and March.

It is news to us that annatto is produced in the Philippine Islands, although some has been in the market heretofore from Ceylon and other East Indian countries.

We shall be very much interested in learning more about the matter, when the crop ripens in the Philippines, and also in regard to the quality. If you will kindly see that small samples are sent to us, we will appreciate it.

¹ From The Agricultural News, Vol. VIII, No. 182, April 17, 1909.

The price of Porto Rico and Jamaica annatto varies from 4 to 9 cents [United States currency]. This season we have been paying from 6 to 7½ cents [United States currency]. Contracts are often made in the fall for delivery during February and March.

It is suggested that Philippine growers of annatto seed correspond with these parties.

EGG-LAYING COMPETITION.

The fifth egg-laying competition, under the auspices of the department of agriculture for Western Australia, will commence on May 1, at Subiaco, about 300 yards from West Subiaco railway station. The competition will run for twelve months, to 30th April, 1910.¹

PEANUT OIL.

In Europe a first-class peanut oil is the most highly esteemed of vegetable oils after olive oil. It is also used in the manufacture of butter substitutes. The low-grade oils are used for soaps.¹

¹ From Journal of the Department of Agriculture of Western Australia, Vol. XVIII, part 4, April, 1909.

AGRICULTURAL NOTES.

Weather conditions.—According to information recently received, the growing crops are generally in good condition, though they vary in different districts. In Samar the drought has done considerable damage and following, as it does, the devastation caused by the hurricanes during the last four months of last year, has caused much destitution among the inhabitants of the province. Most crops suffered considerably, especially palay, there being little hope of a good harvest in Catarman, Villareal, Gandara, Tarangnan, and many other municipalities of the island. This is also true in Carcar, Mandaue, San Remigio, and Tuburan, Cebu, also in Caramoan, Ambos Camarines, and in some other localities. On the other hand, favorable conditions are reported in the municipalities of Valderrama, Antique, Laoag, Ilocos Norte, Peñarrubia, Ilocos Sur, and especially so in Malilipot, Albay, where the crops appear to be in excellent condition. The crops are in good condition in the municipalities of Bobon, Laoang, Borongan, and Oquendo in Samar, and in the place last named farmers expect a regular harvest of palay and corn.

Rice.—The sowing of rice seed is now general in the rice districts. In some districts the seed beds are being prepared while in others the plants are already growing vigorously, owing to the early rains. In Iloilo the condition of the paddy fields in the greater part of the municipalities could hardly be better. From Haniway, Oton, Santa Barbara, Cabatuan, Leon and other municipalities of this province, and from New Washington, Nabas, Odiongan, and Looc of Capiz good news is received regarding the condition of the rice fields and a good harvest is expected. Rice has recently been harvested in Bulacan, Pampanga, and Tarlac, with fairly good results, and the farmers through the island are now busy breaking up the ground and preparing nurseries for the seedlings. The second harvest of palay will take place in July in the Provinces of Pampanga, Bulacan, La Laguna, and some other sections of Luzon.

Sugar cane.—This crop is doing well in the greater part of Rizal, Cavite, and Pangasinan Provinces, but in several municipalities of Negros Occidental it has been injured by the locusts. The fields present a fine appearance in Carcar and Dalaguete, Cebu; Oton and Santa Barbara, Iloilo; Laua-an, Antique, and other important sugar-growing districts.

Corn.—This product is general in the Islands, at large, being used chiefly as a secondary crop. The provinces of Bulacan, Rizal, La Laguna, Batangas, Tayabas, Ambos Camarines, in fact in a lesser degree all of the provinces of Luzon, have large, fertile fields devoted to the cultivation of this crop. In some places the seed is being planted, while in others the crop is already half grown. Cebu largely surpasses all other provinces in the value of this crop, since it largely takes the place of rice as the principal article of food.

Locusts.—Mr. Pablo Tecson, the superintendent of agricultural extension work, says that the swarms of locusts which have recently made their appearance in the Provinces of Bulacan, Rizal, La Laguna, and Batangas are seriously threatening the corn crops as well as the second harvest of palay. So far the Bureau has had reports of these locusts only in the above-mentioned provinces, but if prompt measures are not taken for their extermination they will soon spread to other regions and devastate the fields. The locusts of the Philippines can travel great distances and even pass over large bodies of water, flying from one island to another. They are the great crop destroyers of the Islands, and it is strongly urged that the farmers all unite in keeping off this threatened calamity. It is now possible to minimize this evil, as the locusts have not yet laid their eggs, and prompt action should be taken. In some municipalities the officials and farmers seem thoroughly awakened to the necessity of adopting active measures against this pest, and a great many men have been capturing them and selling them for food, the price quoted on them in the markets having been as high as ₱10 a cavan. The present price is ₱6 a cavan, more than is paid for rice.

Provincial boards in the provinces affected have been urged to take prompt action looking to their extermination, authority being given under Act No. 83, section 13 (*k*), as amended by Act No. 133, section 1 (6), "To adopt, by resolution, regulations for the suppression of any agricultural pest like locusts or cattle disease, to post the same in five conspicuous places in each pueblo, to provide for the enforcement of the same by fixing penalties for their violation not exceeding one hundred dollars fine or thirty days' imprisonment, to confer jurisdiction to try violators of such regulations upon justices of the peace of the province, and to appropriate money from the provincial treasury for the necessary expenses in organizing the temporary force of employees needed to enforce the regulations and for paying the costs of prosecutions before justices of the peace."

The great importance of destroying the eggs which may be laid has been specially urged by this Bureau. The control of this plague is most important, not only for the sake of the growing corn, but also for the sugar cane and the second crop of palay; a total failure of these crops would be the result of an invasion of locusts like the one recorded

in the year 1903, which was the reason for making the Act quoted above.

Animal diseases.—Samar has suffered but little and reports show that the animals there have been unusually free from disease. We have good news from Batangas, Pampanga, and Siquijor Island regarding rinderpest, and excellent news from Isabela. Marinduque and Bohol report surra to be on the decrease and we hope to have similar news shortly from Nueva Ecija, Cagayan, and other provinces where these diseases still prevail. Our veterinarians are doing excellent work and getting very satisfactory results in checking the spread of animal diseases.

CROPS PLANTED AND HARVESTED AND CONDI- TION OF SAME TAKEN FROM MONTHLY CROP REPORTS FOR THE MONTH OF APRIL, 1909.

[RICE.—Attention is invited to the fact that rice should be understood as being in the unhulled state.]

NOTE.—75 liters=1 cavan. 63.25 kilos=1 picul. 46 kilos=1 quintal. 11.5 kilos=1 arroba. 0.4047 hectare=1 acre.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Agusan (reports from 3 municipal- ities):		<i>Hectares.</i>	<i>Hectares.</i>		
Abaca -----	Good -----	4	12	2,214	Kilos.
Tobacco -----	Fair -----	2	2		
Corn -----	Good -----	40	4	8,250	Liters.
Albay (reports from 13 municipal- ities):					
Rice -----	do -----	72	8,155	11,672,250	Do.
Abaca -----	do -----	1,060	4,349	1,171,200	Kilos.
Corn -----	do -----	75	123	39,000	Liters.
Coconuts -----	do -----			670,000	Nuts.
Ambos Camarines (reports from 30 municipalities):					
Rice -----	Fair -----	157	45	1,375,125	Liters.
Sugar cane -----	Good -----	9	162	68,120	Kilos.
Coconuts -----	do -----			988,000	Nuts.
Abaca -----	do -----	98	4,522	1,054,820	Kilos.
Antique (reports from 9 municipal- ities):					
Sugar cane -----	do -----	85	162	284,625	Do.
Corn -----	do -----	344	3	4,650	Liters.
Tobacco -----	Fair -----		20	22,586	Kilos.
Coconuts -----	Good -----			6,000	Nuts.
Bataan (reports from 7 municipal- ities):					
Rice -----	Fair -----	12	429	1,473,600	Liters.
Sugar cane -----	do -----				
Coconuts -----	do -----				
Corn -----	do -----	3	5	1,650	Do.
Batangas (reports from 14 municipal- ities):					
Sugar cane -----	Good -----	1,222	392	642,304	Kilos.
Corn -----	do -----	100	20	131,250	Liters.
Rice -----	Fair -----	698			
Abaca -----	Good -----		41	6,262	Kilos.
Benguet (reports from 11 municipal- ities):					
Rice -----	do -----	52			
Coffee -----	Fair -----	233			
Corn -----	Good -----	23			
Sugar cane -----	Fair -----	2		443	Do.
Bohol (reports from 21 municipal- ities):					
Rice -----	do -----	80	18,562	2,382,000	Liters.
Corn -----	do -----	330	405	445,275	Do.
Coconuts -----	Good -----			1,380,000	Nuts.
Abaca -----	Fair -----		97	19,481	Kilos.
Bulacan (reports from 11 municipal- ities):					
Rice -----	Good -----		10,556	44,829,000	Liters.
Sugar cane -----	Fair -----	1,095	1,930	1,429,450	Kilos.
Corn -----	Good -----	35	5	23,700	Liters.
Tobacco -----	Fair -----	25	31	23,000	Kilos.

Crops planted and harvested and condition of same taken from monthly crop reports for the month of April, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Cagayan (reports from 10 municipalities):		Hectares.	Hectares.		
Tobacco	Good	15	15	6,900	Kilos.
Corn	do	14	776	1,005,000	Liters.
Rice	Fair	21	280	315,000	Do.
Sugar cane	Good	67	67	2,846	Kilos.
Capiz (reports from 21 municipalities):					
Rice	do	2,826			
Corn	do	283	101	66,675	Liters.
Sugar cane	do	265	67	117,266	Kilos.
Tobacco	Fair	9	116	40,572	Do.
Cavite (reports from 7 municipalities):					
Sugar cane	Good	103	70	146,250	Liters.
Abaca	do				
Coconuts	Fair				
Corn	Good	5			
Cebu (reports from 28 municipalities):					
Corn	Fair	2,398	5,785	2,174,250	Do.
Tobacco	do	10	1,327	1,041,946	Kilos.
Sugar cane	Good	11	366	425,989	Do.
Rice	do	6	1,160	993,750	Liters.
Ilocos Norte (reports from 10 municipalities):					
Tobacco	Fair		339	220,754	Kilos.
Sugar cane	Good	488	1,408	153,698	Do.
Corn	do	135	69	13,125	Liters.
Magney	do	20	100	18,975	Kilos.
Ilocos Sur (reports from 22 municipalities):					
Corn	do	86	2,117	394,350	Liters.
Sugar cane	do	322	242	486,899	Kilos.
Tobacco	do	7	292	81,282	Do.
Magney	do	8	681	221,565	Do.
Iloilo (reports from 13 municipalities):					
Abaca	Fair		100	59,455	Do.
Tobacco	Good	5	187	31,004	Do.
Corn	do	303	208	86,625	Liters.
Sugar cane	do	119	89	145,475	Kilos.
Isabela (reports from 3 municipalities):					
Tobacco	do	20		368,000	Do.
Corn	do	1		6,750	Liters.
La Laguna (reports from 13 municipalities):					
Rice	do	1,504	2,800	480,000	Do.
Coconuts	Fair			1,722,000	Nuts.
Abaca	do		393	48,386	Kilos.
Sugar cane	do	480	430	695,750	Do.
La Union (reports from 10 municipalities):					
Tobacco	Good	90	855	508,760	Do.
Sugar cane	do	55	232	276,466	Do.
Corn	do	99			
Magney	do		10	3,163	Do.
Lepanto-Bontoc (reports from 17 municipalities):					
Rice	Good	3			
Corn	do	238			
Tobacco	Fair		78	16,376	Do.
Sugar cane	do	31	6	16,445	Do.
Leyte (reports from 15 municipalities):					
Abaca	Good	108	4,068	823,642	Do.
Rice	do		860	968,700	Liters.
Coconuts	do			1,269,000	Nuts.
Corn	do	173	337	370,500	Liters.
Mindoro (reports from 2 municipalities):					
Sugar cane	do				
Tobacco	do		62	9,660	Kilos.
Abaca	do	1	2	380	Do.
Misamis (reports from 7 municipalities):					
Abaca	Fair	3	161	81,593	Do.
Coconuts	do			443,000	Nuts.
Corn	do	137	30	46,125	Liters.
Sugar cane	Good		8	26,565	Kilos.

Crops planted and harvested and condition of same taken from monthly crop reports for the month of April, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Moro (reports from 5 municipalities):		<i>Hectares.</i> 5	<i>Hectares.</i>		
Rice	Good		43	29,601	Kilos.
Abaca	do			22,000	Nuts.
Coconuts	do				
Sugar cane	do				
Nueva Ecija (reports from 16 municipalities):					
Sugar cane	Fair	16	36	27,830	Kilos.
Tobacco	do		66	26,450	Do.
Rice	do		4,600	9,225,000	Liters.
Corn	do	12	8	1,200	Do.
Occidental Negros (reports from 12 municipalities):					
Sugar cane	Good	1,215	1,820	2,764,025	Kilos.
Tobacco	do		1,300	508,300	Do.
Corn	do	57	455	444,750	Liters.
Coconuts	do			283,000	Nuts.
Oriental Negros (reports from 15 municipalities):					
Sugar cane	Fair	105	105	319,413	Kilos.
Coconuts	Good			424,000	Nuts.
Tobacco	do		1,501	1,039,922	Kilos.
Abaca	Fair		303	119,353	Do.
Pampanga (reports from 7 municipalities):					
Sugar cane	Good	9,375	4,190	698,913	Do.
Corn	do	73	105	82,500	Liters.
Rice	do		200	28,875	Do.
Pangasinan (reports from 28 municipalities):					
Tobacco	do	39	502	155,664	Kilos.
Corn	do	452	615	176,850	Liters.
Coconuts	do			328,000	Nuts.
Sugar cane	do	123	215	49,398	Kilos.
Rizal (reports from 15 municipalities):					
Sugar cane	do	253	90	56,293	Do.
Corn	do	224	1	3,375	Liters.
Rice	do	196	510	487,500	Do.
Samar (reports from 22 municipalities):					
Abaca	Fair	225	859	381,145	Kilos.
Corn	do	92	5	1,500	Liters.
Rice	do	58	1,774	767,400	Do.
Coconuts	do			327,000	Nuts.
Sorsogon (reports from 20 municipalities):					
Abaca	Good	104	3,456	587,656	Kilos.
Rice	do	170	3,036	1,089,450	Liters.
Tobacco	do		516	164,036	Kilos.
Corn	do	24	218	95,250	Liters.
Surigao (reports from 3 municipalities):					
Rice	do		1,200	817,500	Do.
Corn	do	18			
Tobacco	do	8			
Abaca	Fair		200	82,225	Kilos.
Tarlac (reports from 10 municipalities):					
Sugar cane	Good	292	198	157,176	Do.
Tobacco	do	10	35	19,688	Do.
Corn	do	9	18	12,525	Liters.
Rice	do	400			
Tayabas (reports from 14 municipalities):					
Coconuts	Fair			218,000	Nuts.
Rice	Good	1,100	1,626	755,850	Liters.
Abaca	do	9	364	55,597	Kilos.
Tobacco	do		40	46,092	Do.
Zambales (reports from 8 municipalities):					
Sugar cane	do	53	27	20,177	Do.
Corn	do	30	3	675	Liters.
Maguey	do		4	3,852	Kilos.
Tobacco	do		2	280	Do.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

*Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the
month of April, 1909.*

Province.	Unhulled rice, per 75 liters.		Abaca, per 63.25 kilos.		Copra, per 63.25 kilos.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱3.00	2.50	₱8.00	4.74	₱7.27	5.70
Albay	3.50	2.25	7.00	5.00	7.00	4.00
Ambos Camarines	4.00	2.00	11.00	4.40	7.50	3.50
Antique	3.00	1.50	30.00	12.00	6.00	6.00
Bataan	2.50	1.25				
Batangas	3.50	2.00	8.00	7.00		
Benguet	5.00	3.00				
Bohol	4.00	2.00	13.00	5.00	9.25	6.60
Bulacan	2.80	2.00				
Cagayan	4.00	3.50				
Capiz	3.12	1.60	18.00	7.00	7.50	5.00
Cavite	3.00	2.25	10.00	10.00		
Cebu	4.00	2.50	20.00	9.50	8.75	7.00
Ilocos Norte	5.00	3.25			5.00	2.50
Ilocos Sur	5.00	2.30			10.00	10.00
Iloilo	4.50	2.50	16.00	11.00	8.60	6.00
Isabela	5.00	5.00				
La Laguna	3.75	2.00	17.00	5.76	7.00	5.50
La Union	2.50	2.50			6.00	6.00
Lepanto-Bontoc	5.00	3.75				
Leyte	5.00	2.00	14.00	6.00	7.75	3.50
Misamis	3.50	2.50	9.00	6.00	7.50	6.75
Moro	3.50	2.25	10.50	8.50	7.50	7.50
Nueva Ecija	2.50	1.25				
Nueva Viscaya	1.75	1.40				
Occidental Negros	3.00	2.00	12.00	8.00	8.40	5.00
Oriental Negros	5.00	3.00	14.00	6.00	9.00	6.60
Pampanga	2.60	1.75				
Pangasinan	5.00	2.00			8.00	3.00
Rizal	2.75	2.25	18.00	18.00		
Samar	5.00	2.00	12.00	6.00	7.50	5.00
Sorsogon	3.13	2.00	12.50	4.50	6.50	3.00
Surigao	2.50	1.25	10.00	8.00	7.50	6.00
Tarlac	3.75	1.50			4.00	4.00
Tayabas	5.50	2.00	12.00	3.00	6.50	4.00
Zambales	4.00	1.60			5.00	5.00

Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the month of April, 1909—Continued.

Province.	Sugar, per 63.25 kilos.		Tobacco, per 46 kilos.		Corn, per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱6.00	5.50	10.00	10.00	₱2.00	2.00
Albay	5.00	3.00			5.00	1.50
Ambos Camarines	4.00	3.00	25.00	6.00	4.00	1.00
Antique	6.00	3.50			2.50	1.50
Bataan	4.30	3.00	8.00	6.00	2.00	2.00
Batangas	6.00	3.00			4.00	2.00
Benguet	6.00	3.75	4.00	4.00	4.00	2.50
Bohol	6.50	6.00	12.00	12.00	2.50	1.90
Bulacan	4.00	4.00	15.00	10.00	3.75	1.25
Cagayan	7.00	4.00	15.00	5.50	2.50	1.00
Capiz	4.40	2.50			2.25	2.22
Cavite	5.00	2.00	30.00	3.00	4.50	2.50
Cebu	3.50	2.00	18.00	3.00	3.00	1.00
Ilocos Norte	7.00	2.00	25.00	3.50	5.00	2.00
Ilocos Sur	6.00	4.00	18.00	5.00	3.12	2.50
Iloilo			12.00	12.00	2.50	2.50
Isabela	5.00	3.60			3.00	3.00
La Laguna	4.50	2.50	8.00	2.50	4.00	4.00
La Union	6.00	3.00	20.00	2.50	5.00	5.00
Lepanto-Bontoc	7.50	4.50	25.00	15.00	4.00	1.70
Leyte	4.00	4.00	25.00	7.00	3.50	2.50
Misamis					2.50	2.50
Moro	7.50	2.50	20.00	3.00	2.50	1.00
Nueva Ecija					2.50	2.50
Nueva Vizcaya	5.50	3.50	35.00	3.00	4.00	2.40
Occidental Negros	5.00	4.00	25.00	5.00	5.00	3.50
Oriental Negros	6.05	4.07			2.50	2.00
Pampanga	6.40	3.00	30.00	2.00	5.00	1.50
Pangasinan	7.00	2.70			2.50	1.80
Rizal	5.00	5.00	25.00	20.00	3.50	2.00
Samar	6.75	2.50	12.00	4.00	1.60	1.50
Sorsogon						
Surigao	5.70	2.50	7.50	7.00	2.50	1.20
Tarlac	6.00	3.00	8.00	6.00	5.00	3.50
Tayabas	5.00	3.50	25.00	12.00	5.00	2.00
Zambales						

PERIODICALS IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

Everyone interested in the study of tropical agriculture is invited to visit the library and make use of these periodicals.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
Bulletin of the College of Agriculture, Tokyo, Japan.
Hawaiian Forester and Agriculturist, Honolulu, Territory of Hawaii.
Tropical Agriculturist, Colombo, Ceylon.
Memoirs of the Department of Agriculture, Calcutta, India.
Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
Bulletin of the Department of Agriculture, Kingston, Jamaica.
Journal of the Board of Agriculture of British Guiana, Georgetown.
California Cultivator, Los Angeles, California.
The Rural Californian, Los Angeles, California.
Farmer and Fruit Grower, Jacksonville, Florida.
Louisiana Planter, New Orleans, Louisiana.
Southern Cultivator, Atlanta, Georgia.
Progressive Farmer, Raleigh, North Carolina.
Farmer's Guide, Huntington, Indiana.
Independent Farmer, Lincoln, Nebraska.
Kansas Farmer, Topeka, Kansas.
Farm Press, Chicago, Illinois.
The American Florist, Chicago and New York.
The Feather, Washington, D. C.
The American Thresherman, Madison, Wisconsin.
Oregon Agriculturist, Portland, Oregon.
Journal of Agriculture and Horticulture, Montreal, Canada.
The Gardeners' Chronicle, London.
Commercial America, Philadelphia, Pennsylvania.
Tropical Life, London, England.
The Breeders' Gazette, Chicago, Illinois.
The Journal of Tropical Veterinary Science, Calcutta, India.
American Veterinary Review, New York.

REPORTS AND QUOTATIONS.

Crop Reporter, by the Secretary of Agriculture, Washington, D. C.
 Federal Reporter, New York, N. Y.
 Smith and Schipper's Monthly Report, New York, N. Y.
 Hanson and Orth, Hemp Brokers, Monthly Statement, New York.
 Hemp Market Report, Landauer & Co., London.
 Ide and Christie's Monthly Circular, London.
 Exporters and Importers Journal, Chicago, Illinois.
 Ker & Co's. Price Current, Manila, Iloilo, and Cebu, P. I.

LOCAL.

Official Gazette, Manila, P. I.
 Far Eastern Review, Manila, P. I.
 Philippine Journal of Science, Manila, P. I.
 Weather Bureau Bulletins, Manila, P. I.
 The Philippine Agricultural Review, Manila, P. I.

SPANISH.

Boletin de la Cámara de Comercio Filipina, Manila, P. I.
 Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Habana, Cuba.
 Boletin de Agricultura, San José, Costa Rica.
 Hacendado Mexicano, El, Mexico, Mexico.
 Hacienda, La, Buffalo, New York.
 Agricultor Peruano, El, Lima, Peru.
 Prácticas Modernas é Industrias Rurales, La Coruña, Spain.
 Resumen de Agricultura, Barcelona, Spain.

OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
 Bulletin Economique, Hanoi-Haiphong, Indo-China.
 Bulletin du Département de l'Agriculture aux Indes Néerlandaises, Buitenzorg, Java.
 L'Agronomie Tropicale, Brussels, Belgium.
 Boletim de Agricultura, Sao Paulo, Brazil.
 Tamil Journal of South India Agriculture, Madras, India.
 Station Agronomique, Port Louis, Colony of Mauritius.
 Journal d'Agriculture Tropicale, Paris.
 Boletim do Museu Goeldi, Para, Brazil.

THE PUBLICATIONS OF THE BUREAU OF AGRICULTURE.

The following-named bulletins of the Bureau of Agriculture are available for distribution, and will be sent free of charge to any address upon application. Applicants are requested to state whether all publications of the Bureau are desired as issued, or only those specified. The name and address of the applicant should be plainly written and all communications should be addressed to the Director of Agriculture, Manila, Philippine Islands.

FARMERS' BULLETINS.

- No. 4. Preliminary Report on Commercial Fibers of the Philippines. (Spanish.)
- No. 6. Experimental Work with Fungous Diseases of Grasshoppers. (Spanish.)
- No. 9. A few Suggestions on the Cultivation of Cotton. (Spanish.)
- No. 11. The Jute Industry. (Spanish.)
- No. 12. Abacá. (Manila Hemp.) (English.)
- No. 13. The Cultivation of Maguey in the Philippine Islands. (English and Spanish.)
- No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
- No. 15. Tobacco Growing in the Philippines. (English and Spanish.)

PRESS BULLETINS.

- No. 6. The Tamarind. (English.)
- No. 8. Maguey; Propagating Abacá from Seed; etc. (English.)
- No. 9. Agricultural Districts; Control of Rinderpest; etc. (English.)
- No. 11. Seed Distribution; Need of Diversified Farming; etc. (English and Spanish.)

POPULAR BULLETINS.

- No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
- No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)

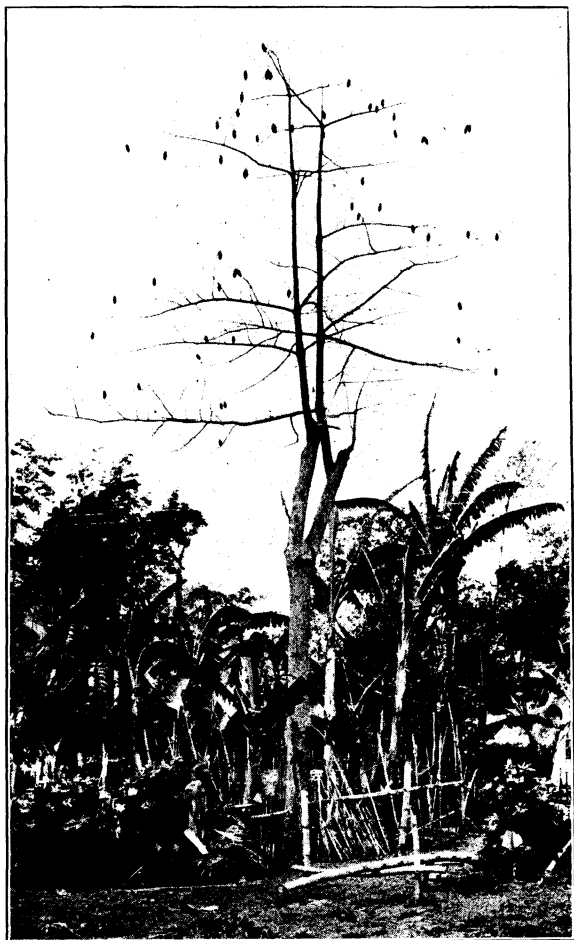


PLATE I.—KAPOK ("ERIODENDRUM ANFRACTUOSUM"),
COTTON TREE, PHILIPPINE ISLANDS.

THE PHILIPPINE *Agricultural Review*

VOL. II

AUGUST, 1909

No. 8

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	424
Next International Rubber Exhibition	430
Farmers' Coöperative Demonstration Work in the United States	431
How a Knowledge of the Weather Benefits the Farmer	433
Kapok (<i>Eriodendron anfractuosum</i>), by Sam. H. Sherard, Agricultural Inspector....	440
Kapok Exports from the Dutch East Indies	443
Some Observations on the Rat Pest, by David B. Mackie, Agricultural Inspector.....	444
The Crop Reporting Service, by W. D. Hobart, Division of Statistics.....	449
The Tensile Strength of Machine and Hand Stripped Abacá Fiber, by R. F. Bacon..	452
The Amended Homestead Law, by C. H. Sleeper, Director of Lands.....	455
Estimated Cost and Profit of Para Rubber Cultivation in the Federated Malay States	457
Philippine Hemp Statistics, 1901-1908.....	461
Philippine Sugar Statistics, 1898-1908.....	463
Philippine Copra Statistics, 1898-1908.....	464
London Copra Receipts, 1896-1908.....	465
Philippine Tobacco Statistics, 1898-1908.....	466
Current Notes: The College of Agriculture; The College of Veterinary Science; The Insular Lumber Company; Philippine Forests; The Beetle Pest; Philippine Terpenes and Essential Oils; The Division of Animal Industry of the Bureau of Agriculture; Philippine Sponge Fisheries; Philippine Coals; De-natured Alcohol; A Philippine Botanical Garden.....	467
Notes from Other Fields: Rice Investigations in Indo-China; Ylang-ylang in Indo-China; Kapok in Indo-China; Fourth Sugar Mill for Formosa; Japan's Sugar Supply; Coconuts and Rice in the Straits Settlements; "Bagasse" as a Paper Pulp in Trinidad; The Study of Forest Trees, by the United States Department of Agriculture; The National Irrigation Congress; Edible Fat from Copra; The Distribution of Improved Varieties of Seed; Cacao in Santo Domingo; "Malva" (<i>Melochia pyramidata</i>); Manicoba Rubber in Jamaica.....	471
Agricultural Notes for May.....	476
Crop Reports for May.....	478
Range of Prices of Philippine Agricultural Products for May.....	481
Periodicals in the Library of the Bureau of Agriculture.....	482
The Publications of the Bureau of Agriculture.....	484

ILLUSTRATIONS.

PLATE I. Kapok (*Eriodendron anfractuosum*), Cotton Tree, Philippine Islands.

	Facing page—
Frontispiece.....	440
II. Leaf, Flower, and Young Pods of Kapok.....	440
III. Cross Section and Longitudinal Section of Pods, Opened Pod and Floss of Kapok	442

EDITORIAL.

NEW FEATURES.

With this number of the REVIEW, we are introducing, or taking up again, some features which it is believed will make the magazine of greater value to the agriculturists of the Islands. Among these features are the Current Notes and the Notes from Other Fields which appear in this number.

Current notes.—The idea of the editors in giving space to current notes is to keep the readers of the magazine as fully informed as possible of the progress of the country along agricultural lines. Such items as the College of Agriculture, the College of Veterinary Science, Philippine Forests, the Beetle Pest, Reorganization of the Division of Animal Industry of the Bureau of Agriculture, Philippine Sponge Fisheries, Philippine Coals, Denatured Alcohol, and a Philippine Botanic Garden should be of interest to everyone, and, in a measure, indicate the agricultural and commercial progress which is being made in the country.

Notes from other fields.—In these notes there is no intention to discuss at length agricultural conditions in other tropical countries, except in so far as they produce the same articles and come in competition with the products of the farmers of the Philippines. Under this heading we shall endeavor to keep Filipino farmers advised as to the methods of cultivation in other tropical countries, that they may determine for themselves the best methods of cultivation and the measures that should be taken to produce the largest and best crops. We will also endeavor to advise our farmers regarding large crops or shortages in the crops of other countries which compete with them in the principal markets of the world. In short, we will endeavor to give, so far as this information can be obtained, the agricultural conditions in the principal countries raising hemp, sugar, copra, tobacco, and other agricultural staples of the Philippines—such information as will enable them to form definite conclusions regarding the supply and demand for the products of their farms. In this number attention is invited to the notes regarding rice, kapok, and ylang-ylang investigations by the government of Indo-China, the status of sugar production in the Japanese Empire, the progress of the rice and coconut industries in the Straits Settlements, the experiments by the sugar planters in Trinidad, the National Irrigation Congress at Seattle, the new products made from copra, the progress of the cacao industry in Santo Domingo, and the rubber industry in Jamaica.

Imports and exports.—By courtesy of the Collector of Customs, we expect to present in the REVIEW, each month, beginning with the September number, a tabulated statement showing the leading exports of agricultural products from these Islands, and the leading imports from other countries which are brought into the Philippines and consumed

by the people of the country. In this manner we will be able, in part, to present to the people from month to month the bills which they are paying to other countries, and the amount of money they are sending out of the Philippines for articles of food, wearing apparel, and other things used in their everyday occupations and business, which could and should be raised, made, or manufactured at home.

FARMERS COÖPERATIVE DEMONSTRATION WORK.

After a short visit in the Philippines, Prof. Albert Bushnell Hart, professor of history in Harvard University, who is a careful student of history and of peoples, prepared a statement for the Boston Transcript on conditions in the Philippines as he saw them during his stay in the Islands. Professor Hart's critical examination of the working of the Government and of the disposition and tendencies of the Filipino people are worthy of careful consideration, not only because he is a trained student of peoples, history, and political economy, but because of his careful, accurate, and farseeing statement regarding conditions here which must appeal to the intelligent and thinking natives of the country, as well as to the Americans who are conscientiously engaged with the Government in its endeavor to solve the social and political problems which fall to the lot of the people of the United States.

Professor Hart states: "It is impossible not to compare the conditions in the Philippines with those in the Southern States, where also there is a dependent race which has to take its law and government from another race." In this section of our own country we have approximately the same tropical or subtropical environment and the same resultant conditions of this environment to deal with. Not only the American negro but the uneducated Southern white man shows decidedly the influence of a tropical environment by exactly the same inclinations and traits of character which are manifested by the masses of the people, more particularly the rural population, of the Philippines. To this extent, at least, the problem of the United States Government at home in the South is substantially the same problem as that of the Insular Government of the United States in the Philippines. Therefore those of us who are endeavoring to solve the problems of the Insular Government should be able to obtain many valuable suggestions and lessons from the experience and work of our National Government in the Southern States.

In education the great need and demand is not only for the education of the masses of the people, but the greater, if not the greatest need, is for intelligent, efficient, and skilled laborers as well as citizens in the everyday callings, occupations, and business of the people who live in the South. To meet these needs and demands there has sprung up in the South, under the leadership of Gen. Samuel C. Armstrong, Booker T. Washington, and others, a large number of schools to prepare and to

help the people to fill the places which they are needed to fill in the new South. Perhaps the keynote of all the work of Booker T. Washington and those associated with him in this movement is his farseeing judgment in going at the root of the matter. He says: "With any ignorant and poverty-stricken race, I believe that the problem of bread winning should precede that of culture;" that "The whole problem of the future of the American negro hinges upon the question, *To what extent will the negro, when given a chance to help himself, make himself indispensable to the community in which he lives?*" So far there is little desire, little coöperation or effort on the part of the masses of the Filipino people toward such a regeneration and re-creation of their country. For the realization of the ideals of the Filipinos, as well as for the realization of our own success in guiding them, this indifference, inactivity and lack of coöperation must be overcome—there must be a new Philippines as well as a new South. Neither the Filipinos nor ourselves can realize the ideals for which we are both striving until there is a definite understanding of the end to be attained and coöperation toward this end for the common good. In order to secure the social regeneration or re-creation, which is the basis of the commercial and political regeneration of the country, new movements must be put in motion, other work than that at present being done by our schools must be done for the regeneration of life in the country.

Perhaps one of the movements which is accomplishing the most for the social and commercial reconstruction of the South is the farmers' coöperative demonstration work of the United States Department of Agriculture. Some time ago, we stated in an editorial that in our opinion the greatest good can be accomplished and the greatest progress made through demonstration work in every department and line of effort by the Insular Government. To any careful student of conditions in these Islands it is clear that the progress of our work is seriously handicapped by the lack of information, of touch with the outside world, of scientific progress along agricultural and other lines on the part of the Filipino people. In order to secure the coöperation of the Filipinos actual demonstrations in all lines of work are necessary. *First*, that they may understand; and *second*, that they may know, as we know, the value of our methods of procedure. Only when the Filipino people clearly understand and realize the value of our methods will we secure their active coöperation in the work which we should be doing together for the common good—for the country—a work which neither one of us can do single-handed or alone. We have spoken of the value of experiment stations, demonstration farms, and agricultural exhibitions, but there must be agencies in operation among the people which will arouse their interest and enthusiasm or these enterprises can not be a success. To meet these conditions in the South, the United States Department of Agriculture has appointed Dr. S. A. Knapp and his son,

two men who have had twenty-five years' experience with Southern agricultural problems, to take charge of this work which aims to secure the following results:

1. The emancipation of the farmer from the bondage of debt.
2. The ownership of more and better tools, teams, and stock on the farm.
3. The improvement of the land.
4. Better rural school buildings and more months of schooling.
5. Better highways, rural mail delivery, and telephone service.
6. Contentment with the life of a farmer.

With the accomplishment of the above-mentioned changes in the status of Filipino farmers it would seem that there would be little more to be desired for the re-creation of country life in the Philippines. When the Filipino farmer has been emancipated from the bondage of debt, when he has improved his lands, when the rural school buildings and schools are what they should be, when the country is supplied with modern highways, rural mail delivery and telephone service, when the life of the Filipino farmer is made such that he finds contentment and satisfaction in his business or profession, it would seem that, in a large measure at least, we will have realized the ideal—the new Philippines will then be a thing of the present.

We commend the farmers' coöperative demonstration work of the United States Department of Agriculture to the people and to the Insular Government of the United States in the Philippines. We commend the making of a large appropriation each year for the agricultural side of this work, and of a similar large appropriation by the Department of Public Instruction for the educational side of the work. We heartily commend a careful and thorough investigation of this work to the people, to our Assemblymen, and to members of the Commission as a plan for the solution of a problem in which we are making but slow progress. We have, and will have more, railroads, highways, and other public works, but these will not serve their purpose, there will be but little farm produce—little rice, sugar, hemp, and tobacco to transport—unless the people in the country, the farmers and the laborers who work on the farms, are awakened by some such agency or movement.

OUR CROP-REPORTING SERVICE.

One of the most important ways in which the farmers can coöperate with this Bureau for the improvement of agriculture in these Islands is by making a careful study of the condition of crops and live stock as required by Act No. 1898, and further outlined in the forms which are sent out by the Bureau of Agriculture. Only by actually noting from day to day the weather and the growth and development of crops under these conditions, is it possible for farmers to determine the most favorable conditions for their crops.

At present very little is known of the details pertaining to the most favorable climatic and soil conditions, and the best methods of cultivation for each of the staple crops of the Islands. If from day to day the farmers will record the climatic conditions and make note of the kind and condition of the soil at the different seasons of plant growth—namely, seeding, transplanting, flowering, maturing, and harvesting—we will be able to determine in a short time the best soils, the best climatic conditions, and the best time for planting each crop. In addition to this we ought to learn (1) the amount of each kind of seed that should be sown on a given area or planted in a hill, (2) the distance hills should be apart, (3) the number of stalks that should be placed in a hill when transplanting, (4) the best condition of the soil for transplanting, and (5) the best cultivation during the development of each plant, which taken together will produce not only the best quality of grain but the largest quantity for each crop. Only when these questions have been definitely settled for the individual farmers of the Philippines will they be able to get the best results from their farms. Then, in a measure, we will have come to the question of *intensive farming*, when farmers should more carefully study the contents and character of the soils of their farms, together with the consideration of questions as to how they may be improved by the addition of fertilizers or manures, or by the rotation of crops, and other methods which tend to conserve the strength and natural richness of soils.

In the May number of the REVIEW, in the report of the director of agriculture for the Straits Settlements and the Federated Malay States, is given a table showing the results of certain experiments in raising rice in the Malay Peninsula. In this table attention is called to (1) the date of planting in the nursery, (2) the date of transplanting in the "semillero," (3) the date of final planting in the field, (4) the average number of stalks or plants in a hill, (5) the distance between hills or "perdus," (6) the number of hills per acre, (7) the date of harvesting, (8) the amount of crop per acre in gallons, (9) the weight of the grain per acre in pounds, (10) the weight of the straw per acre in pounds, (11) the number of seeds or grains in a head. Scarcely any of these questions have been given careful consideration or thought by the average rice grower in these Islands; and yet the successful farmer must, in a measure at least, study these questions and settle each one of them for himself with reference to the varieties of rice raised in order to determine, from the sum total of his experience, what variety of rice is best for him to raise and what conditions of soil, temperature, and rainfall will enable him to obtain the largest quantity and the best quality of crop. These or similar questions may be raised with reference to every crop according to its use and value to the human family. While these questions are primarily questions for this Bureau to settle at its various experiment stations, yet the individual farmer can

not intelligently carry on his work or obtain the best results until he is able to carefully observe and to determine for himself the results of such experiments as will lead him to plant the best kinds or varieties of seed in the soil best adapted to the crop and to use the best methods of cultivation which will result in the most successful farming.

Mr. Clute, an agricultural inspector of this Bureau, while teaching agriculture in the Philippine Normal School demonstrated that corn planted, as it is ordinarily planted in the Philippines, without any thought or effort to obtain the best and largest yield—as was done in making the rice experiments in the Federated Malay States—produces for a given area $10\frac{1}{4}$ pounds of crop; that the same area if planted regularly in rows one-half meter apart and frequently cleaned and hoed will give $69\frac{3}{4}$ pounds of crop, or approximately six times as much; while the same area planted 1 meter apart, with the same cultivation, will give 99 pounds of crop, or more than nine times the average yield obtained by Filipino farmers. Coconut trees are often planted 2, 4, or 6 meters apart, but by experiment any farmer will find that trees planted 9 or 10 meters apart give a much larger yield of nuts.

These illustrations alone should be sufficient to prove to the thoughtful farmer that there is everything to be learned by careful observation and study of crop conditions, and by comparing results under different conditions, as is possible in connection with the crop-reporting service of this Bureau. Without an appreciation of the importance of this work and the enthusiastic coöperation of the farmers very little can be accomplished by the Bureau for the progress of agriculture among the people. On the other hand, if conditions are carefully studied and accurately reported, those observing and studying the effects of conditions on the different plants raised by the farmers will be surprised and wonderfully interested in what they will learn regarding the conditions for growing the best crops in the different sections of the country.

Farmers who desire to undertake some of the above-mentioned experiments, under the direction of this Bureau, for the purpose of finding out the best conditions and cultivation for the staple crops in different sections of the Islands, are invited to correspond with the Director of Agriculture.

THE NEXT INTERNATIONAL RUBBER EXHIBITION.

CHANGE OF DATE TO MAY OR JUNE, 1911.

The executive committee of the above-named exhibition has endeavored to ascertain the most suitable date for all sections of the industry. Careful inquiries showed that while the original date suited the majority, it was inconvenient to others who wished to be represented, and to whom May or June in the following year was preferable. As a result, the committee have agreed to alter the date, and take this opportunity to notify the rubber world that the next International Rubber and Allied Trades Exhibition will be held at Olympia, London, England, in May or June, 1911.

The change, it is understood, is welcome to rubber-machinery engineers who exhibited at the last exhibition, as the orders they have actually received will keep them busy for many months to come. It is therefore well to clear up the business resulting from the first exhibition before starting on the next, which will exceed its predecessor in all ways—in scope, utility, and general magnitude. Requests for further particulars should be addressed to the organizing manager, Mr. Staines Manders, 75 Chancery Lane, London, W. C., England.

FARMERS' COÖPERATIVE DEMONSTRATION WORK IN THE UNITED STATES.¹

The farmers' coöperative demonstration work is an instance of taking education to the man on the job and luring him into the better way. It is instructing the Southern farmers by practical demonstrations on their own farms in the best methods of soil cultivation. The work is a subdivision of the United States Department of Agriculture, conducted by S. A. Knapp and his son, two men who have had twenty-five years of experience with Southern agricultural problems. It aims at these final results:

1. *The emancipation of the farmer from the bondage of debt.*
2. *The ownership of more and better tools, teams, and stock on the farm.*
3. *The improvement of the land.*
4. *Better rural school buildings and more months of schooling.*
5. *Better highways, rural mail delivery, and telephone service.*
6. *Contentment with the life of a farmer.*

A man familiar with local conditions, a practical farmer, is sent around to the farmers in his community. "Use 5 acres in the way I advise you," he says, "and I will give you the seed for nothing." The farmer complies, and cotton, say, or corn is planted and cultivated by the best modern methods.

There is a system of three sorts of agents. The local agent comes from the neighborhood in which he is going to do his work. He receives \$75 a month. He drives around day by day through the different farms, makes suggestions for new methods of planting, and then returns from time to time to see that they have been carried out. He has absolutely no expenses, because he uses his own horse and team and the farmers put him up for nothing. If he were to go to a hotel he would be away from the sources of information, but when he goes right into the family he is able to convince his host of the best thing to do in planting. Over him is the district agent, who receives \$100 a month and expenses. These expenses are the railway fares which he has to pay out in traveling from county to county where his local agents are at work. Over the district agent is the agent for the State, who receives from \$125 to \$150 a month.

¹ From Collier's, Vol. XLIII, No. 14, June 26, 1909.

This division has 325 such traveling agents. It watches their careers by a system of gaudy-headed pins as the agents make their rounds. Oftentimes a locality will vote part of the salary for its agent because it realizes the large benefits derived from his services. Sometimes a community will give \$100 a month to a district agent and the division will then add \$25. The United States Government gives an appropriation of \$225,000 a year, and the General Education Board gives \$102,000 a year.

This demonstration system began with the fight against the boll weevil of Louisiana. The campaign was then taken up in Texas, and since then has spread through Oklahoma, Arkansas, and Mississippi. Not only has it been a campaign against the Mexican boll weevil, but the other local needs of each section have received attention and the work has extended itself into Alabama, Georgia, Florida, South Carolina, North Carolina, and Virginia. These demonstrators are preaching to their localities the need of raising supplies of all sorts at home and of cultivating cotton intensively as a cash surplus by raising corn and other supplies on the same farm. The one-crop idea has been disastrous to Southern prosperity. The great central West made itself independent by raising its own supplies of every sort, instead of sticking to the one-crop idea.

HOW A KNOWLEDGE OF THE WEATHER BENEFITS THE FARMER.

(Contributed by the Weather Bureau.)

Besides, of course, the proper selection of crops suited to a given region, climate and soil are the two principal factors upon which the fruit of the farmer's toil depends. Now the climate of a place is nothing else than the combination of weather conditions so far as it affects life (both animal and vegetable), health, and comfort; hence it is evident that weather has an important bearing on agriculture, and that a knowledge of it is useful to the farmer.

Unfortunately, the problem of how and to what extent variations of climatic conditions affect animal and plant life is much more complicated than appears at first sight. Of course, every child knows that a flood, as well as prolonged drought, will kill most crops; but this does not exhaust the subject. Three different ways of solving the problem are in general use:

1. Biological investigation: The plant biologist concerns himself with the conditions and manner in which seeds germinate, the absorption of nutritive substances from the soil by the roots, the flow of the sap, the action of sunlight on the leaves, the ripening of seeds, and the nutritive value of the crops. All these functions he investigates under widely varying climatic conditions, produced artificially in the laboratory, to determine how different climates will affect the cultivation of the plants in question.

2. Experimental work: The experimental method of determining the relation between crops and climate is that practiced at agricultural experiment stations. Such institutions are quite numerous in Europe and the United States but there are few in the Philippines. The object of these institutions is chiefly to investigate the effect of natural weather upon different seeds and plants in order to ascertain the most profitable crops for a given climate; to learn whether or not desirable plants can be acclimated; and, eventually—by scientific cross-breeding and careful selection—to develop new varieties of plants which will be suited to given climates.

3. Statistics: The statistical method of ascertaining the effect of climate upon crops consists in compiling and comparing statistics of

successive crops and of the weather which prevailed during the respective seasons. Though this empirical method is far from being perfect and at most only shows us what has happened under certain conditions without letting us know, except in a general way, the "why" thereof, still it is of great practical value and is in fact the only method directly useful to the farmer. After all, the agriculturist cares very little for the "why," provided his granary is overflowing; and in case of a failure of crops in consequence of a drought it would presumably be small consolation to him to know to a milligram the amount of water per square centimeter of leaf surface which must be supplied to a specified plant every twenty-four hours to enable it to flourish with the thermometer registering 35° C. This remark does not imply that the work of the scientific investigator and the experimentalist are not of the greatest importance to agriculture; on the contrary it is devoutly to be wished that circumstances may permit of vastly extending both laboratory and experimental farm work in these Islands. It is only asserted that their results do not affect the husbandman who has crops growing in the field so immediately as do those of the statistical method.

Ever since its establishment in 1865, the Manila Observatory has collected weather statistics of the Philippine Islands. Progress has been slow, nevertheless the accompanying list shows 26 stations which furnished weather records prior to 1898. Thanks to the Weather Bureau, established by the Philippine Government in 1901, a fair amount of weather statistics has been gathered. In the list given below are shown all the stations at which any meteorological observations have been made for a period of two or more years. This list needs no explanation; it is sufficient to state that only the principal crops of each region have been mentioned. The letters "Cont." in the column headed "End." signify that the respective stations are still in operation.

Meteorological stations in the Philippines, 1865-1909.

Province and island.		Station.		Crops.	Period of observations.			Remarks.
		Town.	Class.		Begin- ning.	End.	Years.	
Moro:								
Olo		Jolo	V, III	Miscellaneous	1894	Cont.	*12	Interrupted, 1898-1902.
Basian		Isabela	IV	Sugar, coffee, corn	1903	Cont.	6	
		Zamboanga	V, I, III	Rice, copra, hemp	1894	Cont.	9	Interrupted repeatedly.
		Mari	V, III	Hemp	1897	1898	2	
		Davao	V, III	Rice, hemp	1895	Cont.	11	Interrupted, 1898-1901.
		Tamontaca	V, III	Sugar, rice	1894	1896	3	
		Cotabato	V, III	Sugar, rice	1895	Cont.	10	Interrupted, 1898-1902.
		Caraga	III	Hemp, tobacco	1903	Cont.	5	
		Dapitan	V, III, IV	Hemp, rice	1893	Cont.	12	Interrupted, 1898-1902.
		Belingasing	III	Hemp, rice	1902	1907	6	Many months missing.
		Buntan	III	Hemp	1903	Cont.	6	
		Tandag	V	Hemp	1896	1898	3	
Agusan, Mindanao		Tagbilaran	II	Rice, corn	1902	Cont.	7	
Surigao, Mindanao		Surigao	II	Hemp	1902	Cont.	7	
Surigao, Mindanao		Masini	II, III	Hemp	1902	Cont.	7	
Cebu		Cebu	A, S, I	Rice, sugar	1878	Cont.	13	Interrupted repeatedly.
		La Carlota	A, S	Rice, sugar	1889	1897	9	
Occidental Negros		Bacolod	III	Rice, sugar	1902	1908	7	
		Iloilo	A, S, I	Sugar, rice	1894	Cont.	11	Interrupted, 1896-1901.
Antique, Panay		San José	III	Rice, corn	1902	Cont.	7	
Cebu		Tuburan	IV	Hemp, sugar	1891	Cont.	7	
Palawan, Cuyo		Cuyo	IV	Miscellaneous	1891	Cont.	9	Interrupted several years.
		Ormoc	I	Hemp	1902	Cont.	7	
		Tagloban	II	Hemp	1904	Cont.	5	
Capiz, Panay		Capiz	II	Rice, copra	1902	Cont.	7	
Samar		Barangay	IV	Hemp, copra	1903	Cont.	6	
		Catbalogan	V	Hemp, rice	1904	Cont.	5	
Palawan, Culion		Culion	V, III, II	Miscellaneous	1906	Cont.	3	
Samar		Calbayog	V	Hemp, rice	1890	Cont.	19	
Masbate		Palanog	IV	Copra, rice	1904	Cont.	5	
Romblon		Romblon	III	Copra, hemp, rice, tobacco	1903	Cont.	6	
Leosang		Leosang	III	Hemp	1906	Cont.	8	
Sorsogon, Luzon		Gubat	III	Hemp	1893	Cont.	16	
Albay, Luzon		Legaspi-Albay	I	Hemp	1891	Cont.	15	Interrupted, 1898-1902.
Albay, Luzon		Tabaco	V	Hemp	1890	1898	9	Many months missing.
Mindoro		Mamburao	III	Rice, copra	1896	Cont.	4	
		Calapan	III	Rice	1907	Cont.	2	
Camarines, Luzon		Nueva Caceres	Sp., III	Rice, hemp	1887	Cont.	8	Interrupted, 1888-1902.

REMARKS.—I. In the third column, "Class" refers to the new organization of the Weather Bureau in May 1901. "V." means volunteer observer. "Sp." means that the place was a regular station of the Spanish "Servicio Meteorológico de Filipinas." "A. S." means astronomical station. Many abbreviations applied to the same station mean that the place has been successively working on different capacities.

II. Beside the stations above mentioned there are others in which meteorological observations were conducted by volunteer observers for one or, at most, two years, as, for instance, Polloc, Gigaquit, Tandac, Sigaboy, etc., in Mindanao, and some others in Luzon. These observations are published in the Boletín Meteorológico of the Manila Observatory, and correspond to the epoch 1890-1898.

In discussing the benefits to be derived by the agricultural population from a knowledge of the weather we must distinguish between normal and actual weather. The *normal* weather of a place (which is almost though not quite synonymous with climate), as it is usually called, is the average weather deduced from a series of observations covering several years. In the tropics a period of five years is generally sufficient to give a fair approximation. What *actual* weather means is clear. It must not be confused with abnormal weather; the latter designation is to be applied only when the departure from the normal or average conditions is considerable.

Now, even to the scientific investigator in his laboratory and to the expert in charge of an experimental farm, a knowledge of the climatic conditions under which his results are to be applied to practical agriculture is very necessary. Otherwise his labors may increase our theoretical knowledge, but will not benefit the farmer out of whose taxes the expenses of the investigation are defrayed.

As regards the direct benefits to be derived by the agriculturist from a knowledge of the weather, it is surely not less becoming to the farmer than to people in other walks of life to know something about the forces which affect his personal welfare; moreover, although he can not control the meteorological elements which make up climate, he can, in many instances, profit by accommodating himself to them. If free to choose, a knowledge of the normal weather of a region will tell him what soil will be preferable and he will not undertake to bring lands under cultivation which give no hope of success. If bound to a certain farm, his knowledge of the normal conditions is likely to give the best returns for his exertions. It was due in great part to a complete disregard of such conditions that in certain parts of the Island of Cebu people persisted in planting rice, though the normal rainfall showed clearly that the crop could succeed only by accident.

A knowledge of the normal weather conditions becomes very important when there is question of attempting to control the only climatic element which can be controlled, or, more properly speaking, supplemented to a certain extent; that is, the supplying of the requisite amount of water by irrigation works. It would evidently be foolish to construct such works in regions in which the total water supply available is inadequate for the purposes of raising crops. Even where there is no doubt of this sufficiency, the irrigation engineer will have to be guided by weather statistics, showing not only the amount, but also the distribution of precipitation, etc., lest his work prove either of too small capacity to meet the demands, or be unnecessarily large and costly.

A knowledge of the actual weather prevailing over extended regions is not of great utility to the farmer in the tropics. In the United States hundreds of thousands, if not millions, of dollars are occasionally saved to the farming community in a single year by timely warnings against

approaching cold waves. This danger does not threaten the Philippine farmer, and against the one which actually menaces him, the devastating typhoon, he is utterly helpless. Still, information regarding the current weather in different parts of the Archipelago may be of some use to him, since it will enable him to forecast the abundance or scarcity of the more important crops and consequently the conditions of the market.

At the request of the Bureau of Agriculture, the Weather Bureau has undertaken to furnish henceforth, two weeks after the close of each month, a summary of the meteorological elements which most directly affect crops, for insertion in **THE PHILIPPINE AGRICULTURAL REVIEW**.

The stations selected represent the average weather of the districts in which the most important products of the Philippines are raised: thus Tacloban and Albay represent the hemp district, the sugar and rice districts are represented, respectively, by Iloilo and Tarlac, while the tobacco region is represented by San Fernando (Union) and Aparri. More typical places could, no doubt, be found than those selected, but they either have no meteorological stations, like Bacolod, Negros, or the postal facilities or other difficulties, are such as to preclude the possibility of getting the reports in time for publication.

KAPOK.

(*Eriodendron anfractuosum*.)

By SAM. H. SHERARD, *Agricultural Inspector*.

Botany.—The kapok is a tall tree with a straight trunk, prickly when young, with whorls of horizontal branches palmately compound, deciduous leaves, and flowers appearing before the leaves, followed by pods containing the silky floss.

The flowers are dirty white with a staminal tube splitting into five portions, each with two anthers. The corolla is five-lobed with petals joined near the ovary. The petals are of a creamy color, covered with a minute hair-like growth and are about one-half inch in length, one-fourth inch in width at the center, and taper to a point at the terminal end. The stamens are in five bundles with filaments joined at the base, each bearing versatile anfractuose anthers; the style is crowned with a five- or six-cleft stigma. The pollen is discharged through longitudinal slits in the anther cells.

The leaflets vary in number from five to nine, though seven is the usual number found in the Philippines. They are lanceolate, cuspidate, entire or serrate toward the point; the petioles are as long or longer than the leaflets, the stipules small and deciduous. The capsule is cucumber-shaped, woody when mature, five-celled, five-valved, cells many-seeded, with seeds embedded in the flossy down.

The receptacle is club-shaped, and the floral organs rise from it in successive sets.

Distribution.—The kapok tree is found throughout the provinces generally, though it is only cultivated to a small extent in and around the barrios and towns, at which places the trees are used for fence posts and telephone poles, while the fiber is used for stuffing pillows and cushions. It is also used in upholstery. The floss is brittle, elastic and very inflammable, and it is usually about 1 to 1½ centimeters in length. It is too short for spinning purposes. "Its elasticity and harshness prevent its becoming matted, as in the case with Sinal floss," says Doctor Warden, "and therefore it is considerably superior to that fiber."

• In the cultivated state, or when the trees are used for fence posts, they

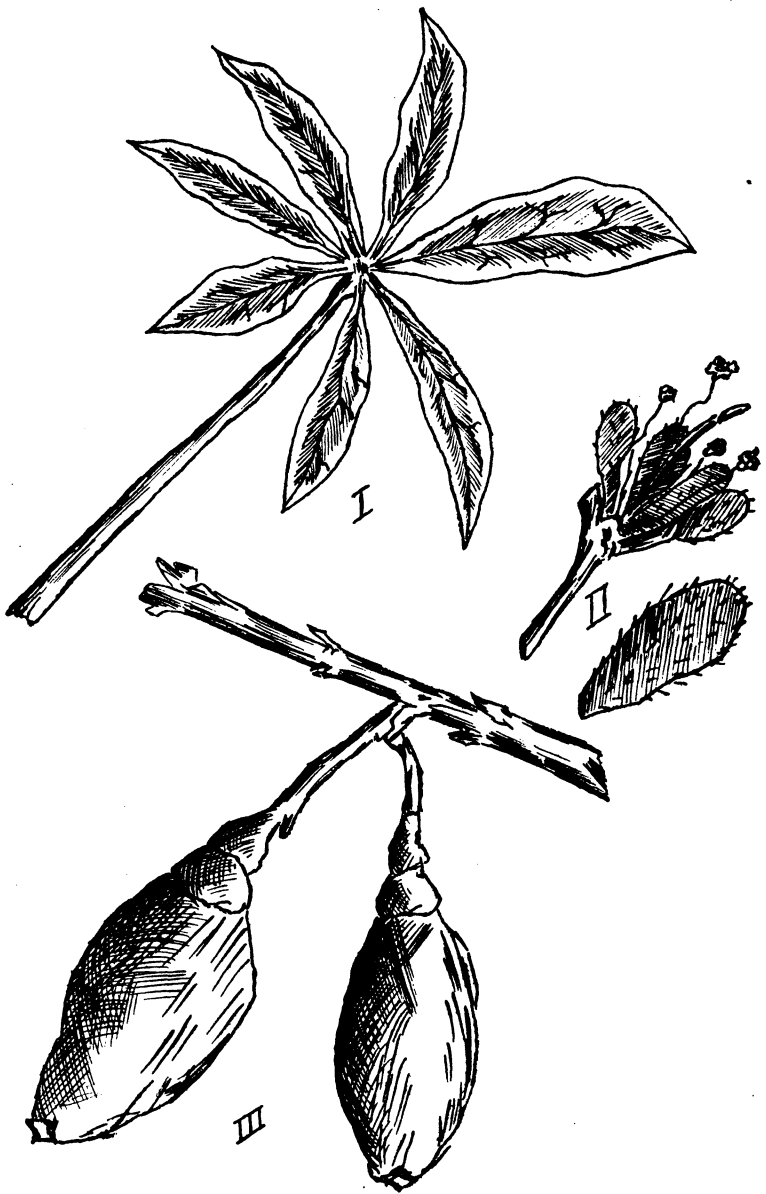
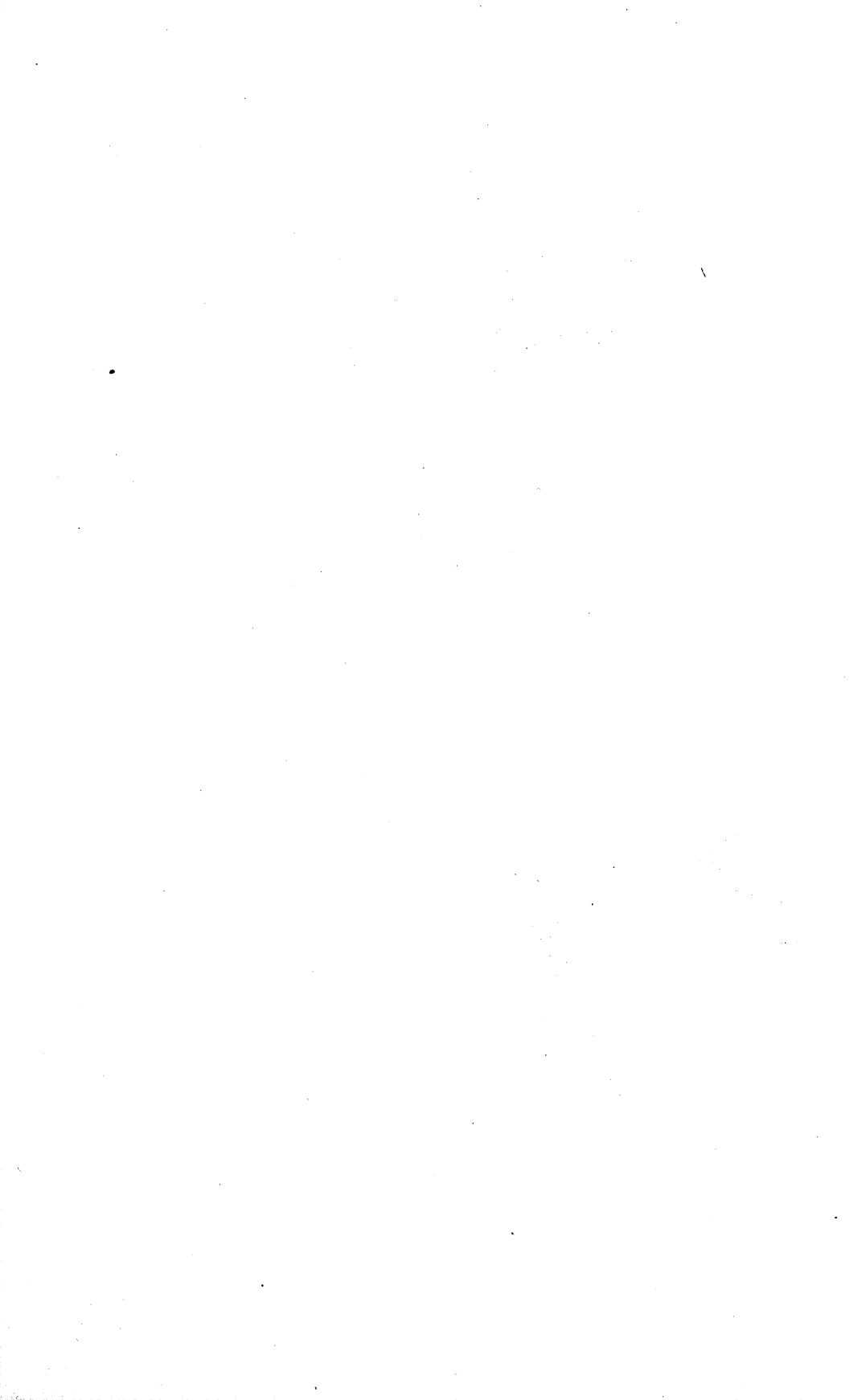


PLATE II.—LEAF, FLOWER, AND YOUNG PODS OF KAPOK.



are from 1 to 20 feet apart. The flowers, as a usual thing, begin to open in December, though they vary in different provinces. Blooms have been noticed by the writer in March. He has also seen blooms, buds, young and old pods on the same tree at the same time.

The number of pods on a tree varies according to whether the tree has been topped or not, and as to whether the enemy of the fruit buds has eaten them or not. A tree 15 inches in diameter has from thirty to one hundred and thirty pods.

The pods begin to ripen about the first of April. At this time they are taken from the trees as they ripen, opened by hand, and the fiber dried in the sunshine. Then a small quantity of the floss is put into an earthen jar. Into the jar containing the fiber is placed a stick about 1 meter long, with a piece nailed across the lower end to form a cross. The handle of this stick is taken between the palms of a man's hands and by moving the palms forward and backward the stick is made to revolve and thereby the seeds are separated from the floss or fiber.

The seeds of the kapok tree have been made into cakes and the comparative value of these cakes and ordinary cotton-seed cake for cattle feeding purposes has formed the subject of an inquiry by Mr. Reinders and the following analytical results were obtained:

Constituent.	Kapok cake (percent).	Cotton-seed cake (percent).
Water	13.28	12.00
Albuminoids	26.34	20.62
Fat	5.82	6.36
Non-nitrogenous compounds	19.92	35.42
Woody fiber	28.12	20.36
Ash	6.52	5.64

The ash of the kapok seeds contains 28.5 per cent of H_3PO_4 and 24.6 per cent K_2O . They also contain an oil which is edible.

Doctor Cooke of India has the following to say about the gum of kapok: "The gum is said to be astringent and is used medicinally in bowel complaints." He also says: "The wood is very bright and soft; it is used in tanning leather and sometimes it is hollowed out and used for canoes. An inferior reddish fiber is prepared from the bark which is used for making paper and ropes."

The only enemy of kapok is the "fruit bat." This animal attacks and eats the young buds. There is no specific remedy, but the natives place a bell in the tree and attach a string to it; by means of this string they ring the bell and scare the bats.

The fiber from 100 average size pods weighs 3 pounds 11 ounces. One hundred pods are sold for 25 centavos.

Kapok statistics.

No. of tree.	Diameter (inches).	Height (feet).	Age (years).	Date of flowering.	Number of pods.	Topped or not.	Cultivated.
1	3	12	1½	December-March	4	No	No.
2	3½	15	2	do	14	No	No.
3	15	50	15	do	79	Yes	Post.
4	17	50	16	do	80	Yes	Post.
5	15	40	15	do	45	Yes	Post.
6	16	40	15	do	29	Yes	Post.
7	6	25	5	do	23	Yes	Post.
8	15	40	15	do	67	Yes	Post.
9	10	30	10	do	20	Yes	Post.
10	15	40	15	do	65	Yes	Post.
11	15	40	15	do	30	Yes	Post.
12	14	35	14	do	25	Yes	Post.
13	14	35	14	do	15	Yes	Post.
14	18	50	17	do	30	Yes	Post.
15	13	25	12	do	26	Yes	Post.
16	16	45	16	do	30	Yes	Post.
17	6	25	5	do	37	No	Post.
18	7	20	6	do	65	Yes	Post.
19	15	40	15	do	29	Yes	Post.
20	8	40	7	do	80	Yes	Post.
21	14	50	14	do	130	Yes	Post.
22	10	40	10	do	35	Yes	Post.
23	11	40	10	do	45	Yes	Post.
24	7	40	6	do	20	No	Post.
25	10	40	10	do	70	Yes	Post.

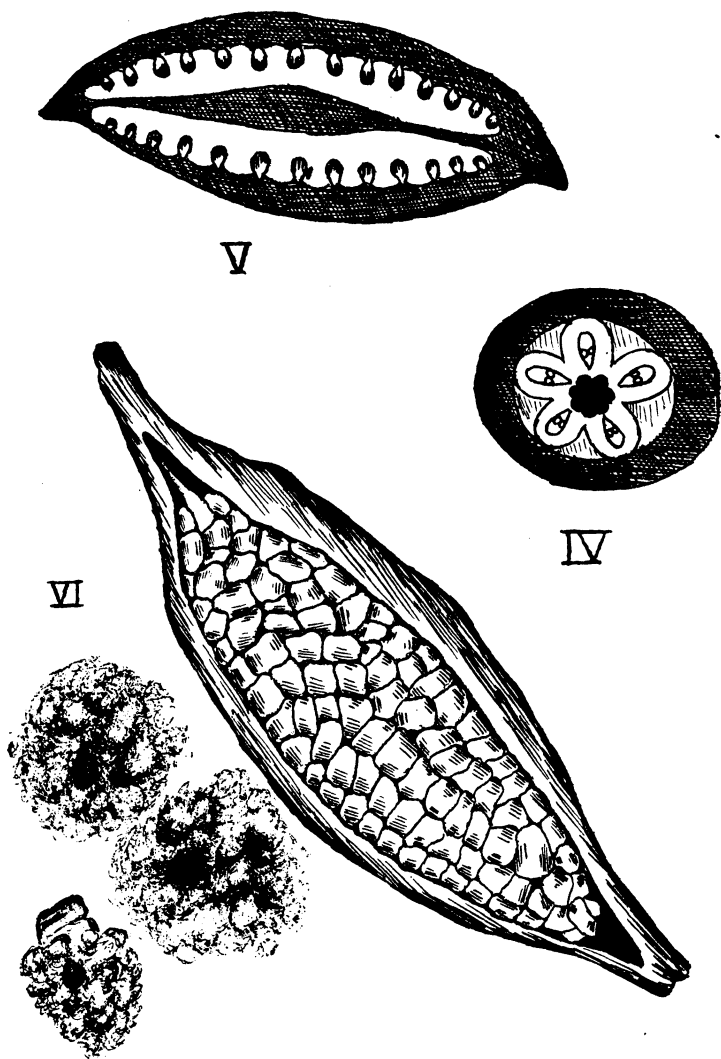
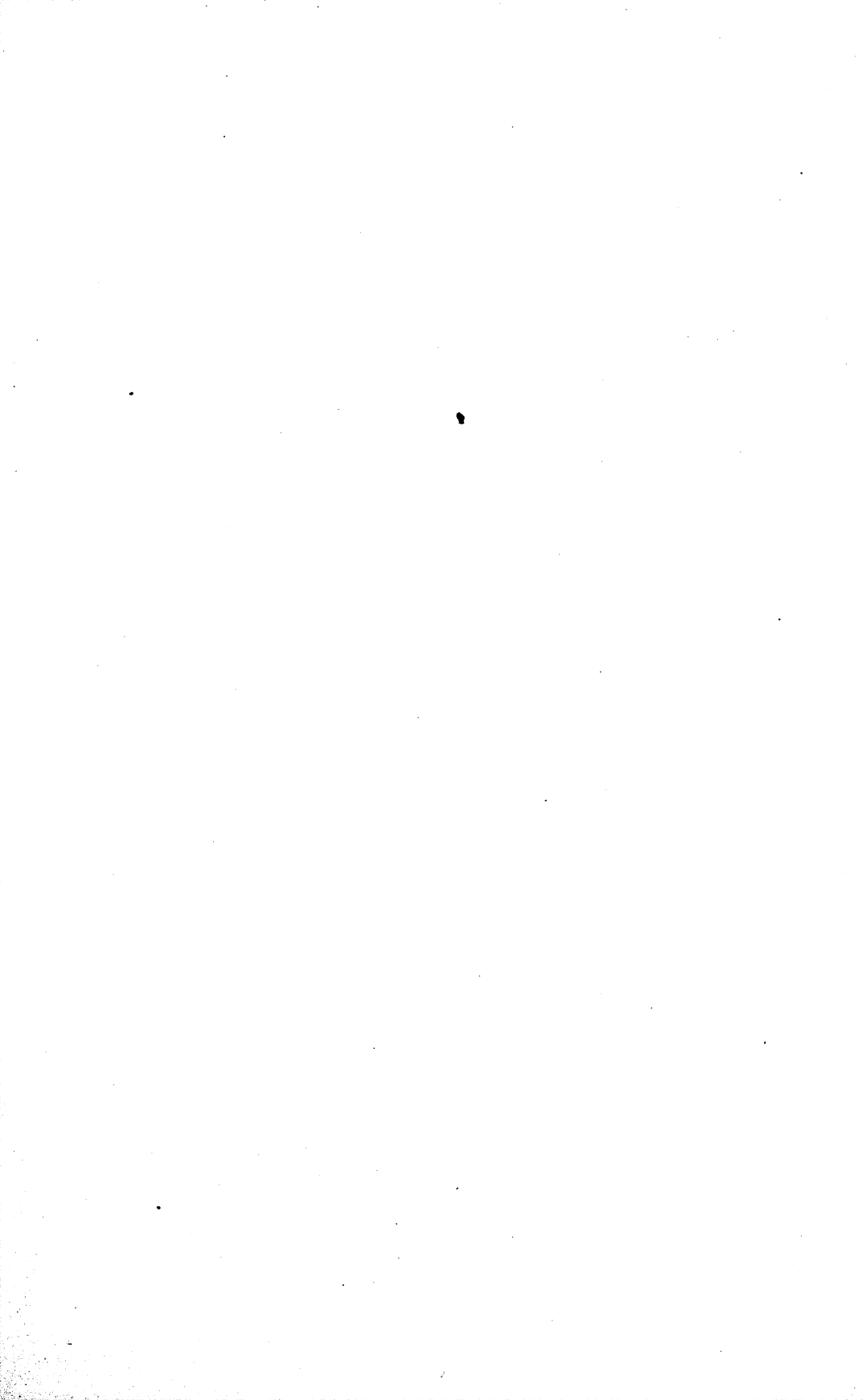


PLATE III.—CROSS SECTION AND LONGITUDINAL SECTION OF PODS,
OPENED POD, AND FLOSS OF KAPOK.



EXPORTS OF KAPOK FROM DUTCH EAST INDIES, 1904 TO 1907.¹

[In kilograms.]

	1904.	1905.	1906.	1907.
Exports to—				
Netherlands	2,684,114	2,603,752	2,246,500	3,703,745
England	5,443	20,130	87,338	64,187
France	17,689	56,196	142,865	308,864
Germany		2,457	9,634	14,489
Denmark			2,126	2,703
Italy	6,155	26,249	24,902	23,243
Spain				1,061
Port Said			20,013	14,577
America	606,558	1,514,376	1,275,709	1,445,829
English Indies			52,315	38
Penang	51,515	32,352	29,406	29,120
Singapore	817,687	823,898	517,572	631,795
Hongkong	121,790	10,227	103,245	36,479
China	2,616	2,233	27,175	1,000
Japan		96,134	7,194	1,002
Australia	976,186	1,697,500	1,676,069	2,638,648
Other places	328	1,074	34,897	
Total	5,290,090	6,886,578	6,256,951	8,916,780
Exports from—				
Batavia, Java				895,125
Cheribon, Java				315,198
Tegal, Java				131,606
Semarang, Java				4,674,170
Sourabaya, Java				2,832,105
Makassar, Celebes				213,251
Palembang, Sumatra				203,441
Other ports				151,884
Total				8,916,780

¹ From the Statistics of Trade, Navigation, and Commerce for the Dutch East Indies, by courtesy of P. K. A. Meerkamp, consul for the Netherlands.

SOME OBSERVATIONS ON THE RAT PEST.

By DAVID B. MACKIE, *Agricultural Inspector.*

Probably the greatest pest that is infesting the country in general, and on which an almost universal warfare is being waged, is the rat. Of all mammalian pests it is the most insatiable. The damage to crops through its agency amounts in some European countries to over ₱20,000,000 annually.

As carriers of disease rats are far more dangerous than as destroyers of crops. The health department of India has invariably traced to the rat the cause of bubonic plague which annually claims so many victims in that country. The agency by which the disease is carried from the rat to the human being is rat fleas (*Pulex cheopsis*), which thickly infest the rat's fur; as these parasites flourish on human blood one can readily see how a rat that has been contaminated by plague germs can easily spread the disease to man.

In the United States the significance of rats as a pest has only lately been realized, but it has reached a stage where legislation has been secured to suppress them, and the Government has published bulletins containing formulas for poisons said to be effective in destroying them.

In Europe and Asia, the original habitat of the rat and where it has remained undisturbed for centuries, the number has increased to such huge proportions that it has become necessary to organize special societies for its suppression and to secure the financial and active aid of the respective governments.

During the past few years the agricultural journals of the Federated Malay States, India, Ceylon, Java, and other islands have reported considerable damage to rice and other cereal crops by this pest. Of late reports have reached this Bureau that in these Islands considerable damage is being done in many provinces to the rice crop through the same agency. Judging from the reports received by the Bureau, the provinces of southern Luzon and the adjacent islands seem to be more widely infested than other sections, although reports have been received from the Province of Bataan and the Islands of Panay and Negros.

SPECIES.

In the latter part of January of this year the writer was detailed by the Director of Agriculture to study the habits of the rodents, also those of any other pests of the rice crop, and if possible ascertain some method of exterminating them. In connection with the work the

Provinces of La Laguna, Albay, Sorsogon, and the Catanduanes Islands, a subprovince of Albay, were visited. The greatest damage in the majority of cases may be attributed to a large gray rat which closely resembles the common brown rat, *Mus norvegicus*, and is probably that species. Specimens of this species were secured in every barrio and municipality of the three provinces visited. Specimens of three other species were secured, but I found them extremely rare and I do not believe that they occur in sufficient numbers to materially affect the crops.

OTHER PESTS.

Before taking up the methods of extermination it might be well to state that in some cases the damage that is attributed to rats is the work of other pests.

Month larvæ.—I visited the municipality of Bacon in Sorsogon Province from which reports of damage by rats had been received. On investigation a large percentage of the damage was found to be the work of the larvæ of a certain moth. The eggs of this species are deposited on the stalk about 2 inches from its base. As these hatch the nymph eats in the stem and takes up its abode, working its way upward and eating as it goes. Upon arriving at maturity it eats its way out, leaving a ragged hole which causes the stalk to fall and gives one the impression that it is the work of rats.

Ducks.—Wild ducks, principally the Luzon mallard (*Anas luzonica*) and another small brown duck (*Dendrocygna arcuata*) do considerable damage in such a way that it might, by an inexperienced person, be misunderstood and charged to the rat. They alight in large numbers in the fields and lay the rice flat in certain areas, thus giving one the impression that it is the work of rats.

Birds.—Rice finches (*Munica jagori*, *Urolonca everetti*, and *Munia oryzivora*), which are very common in some districts, do considerable damage, but the people never confuse their work with that of the rat, as they alight on the stems and strip the heads without breaking the stalk.

LIFE HISTORY.

A very imperfect knowledge of the habits and life history of the rats has proven a great hindrance to the work of extermination, to say nothing of the lack of interest displayed by certain persons who should be most interested. As a result of our investigations for the past five months in the two most heavily infested provinces, we have now secured considerable data pertaining to the life history of rats.

During the rainy season most of the rats live in the mountains, although some spend that period in houses. As the paddies dry out the rats descend from the mountains in immense numbers and, separating into small communities, begin operations. At this time the crop is

beginning to ripen and the grain is in the milk. The stems of the plants are gnawed at a distance of about 4 or 5 inches from the base and then pulled down by the rats. In their workings they do not cut off the stalks in definite areas, but work inward, extending their runways and cutting off the plants on both sides as they advance, making paths of considerable length, running in no definite direction. On close observation it is generally found that the main paths start from some more elevated section or other favorable location.

At this season they also breed. The nests are generally located in a hollow post, a bamboo thicket, or some pile of débris. They are ramshackle affairs composed of a few leaves and perhaps a few blades of grass. Here the young are brought forth. When first born they are helpless, being blind and hairless, measuring 35 millimeters in length. In about eight or ten days the eyes open and they are able to walk a little, but they generally stay in or in close proximity to the nest for about a month, although I have seen specimens in their nests which were much older.

In the common species the number of young brought forth at a time varies from three to eight. The average number is from four to six. Mature rats are very prolific, generally breeding three or four times a year. As they begin to reproduce when three months old, it will readily be seen that the progeny of one pair, if left undisturbed, would in a single year amount to about 1,000 individuals.

The other three species, as previously stated, are rare and I have had no opportunity to work out their life histories. An adult male specimen of the small brown variety taken in Viga, Catanduanes, measured 240 millimeters total length, the body being 110 millimeters and the tail 130 millimeters. Another specimen taken at Bagamanoc was a small gray rat with white under parts. It was an adult pregnant female and contained six fetuses. This specimen measured 220 millimeters, the body measuring 105 millimeters and the tail 115 millimeters.

METHODS OF EXTERMINATION.

Regarding the possibility of exterminating rats, I will say that it is not a task that can be handled by one man and finished in a season. It will require the coöperation of the municipal presidents and *tenientes* of the barrios as well as of the entire population of the infested areas.

Time for operations.—From the time that the rice crop is harvested until the commencement of the rainy season would seem to be the best time to deal with this pest. This season has two great advantages. *First*, the rats are in the fields in large numbers and they are breeding; their food supply is quickly cut off and they are left starving. This fact was established by investigations in the barrio of Bagamanoc, Catanduanes, Albay Province. In this province, where the rats were very prevalent, twelve traps were set every night. Each morning the traps

were collected and the contents examined. The catch varied from 80 to 100 per cent of the possible. Generally we caught ten rats for every twelve traps set. The rats trapped were in turn eaten by other rats. This fact goes to show that the rats were sorely pressed by hunger when they resorted to cannibalism. *Second*, climatic conditions are most favorable at this time as the paddies are dry, and as there is little rain falling the baits do not become disintegrated by the action of the water.

The methods of destroying rats are many and diverse. They vary from the old-fashioned rat trap to bacterial cultures. One method which I think worthy of consideration involves the reversing of a biological law. It might be practicable in these Islands, but I think it would prove rather expensive. The agent by which this reversion could be brought about is a trap that will catch the rodents alive. Scientific experiments show that a larger percentage of males are trapped than females. Thus the tendency of the remaining males would be toward polygamy. In polygamy the tendency of the females is to produce a large percentage of female offspring. Thus in a short while the pest would gain by the increased number of females what it had lost by trapping or poisoning. By reversing this condition, which could be done by releasing all captured males and killing all the females, polyandry would necessarily result. Where there is a superabundance of males, the tendency is to kill off the young and to worry the females. It would be no great time until the males killed off all the females and eventually they would exterminate themselves.

Viruses.—Of the different viruses those prepared by Danysz, of the Pasteur Institute of Paris, and Newman, of Arlborg, Germany, are the most notable.

The Danysz culture is the outcome of extensive investigation and experimental work which was made possible by a spontaneous outbreak of disease among the field mice in France. Doctor Danysz investigated the epidemic and after prolonged research succeeded in finding the cause, the germ *Cous bacillus*. By dint of continued effort and perseverance he ultimately isolated the microbe. Moreover, he cultivated it and obtained cultures in sufficient quantities to meet commercial demands. This virus acts upon the digestive organs. It sets up a violent intestinal irritation similar in its diagnosis to virulent typhoid fever. The disease is highly contagious and is quickly disseminated. In some cases older rats which were of robust constitution were able to withstand the first effects of the disease and became, as it were, inoculated, rendering themselves proof against the microbe.

The Newman virus which acts in the same way as that prepared by Doctor Danysz—that is, upon the intestines—was also obtained after very extensive investigation. The first bacteria to be isolated were obtained from the urine of a two-year old child.

Poisons.—In the Journal of Agriculture for the Federated Malay States carbon bisulphide is mentioned as a chemical which has been used successfully in reducing the rats in that country. The method most commonly used is to investigate the land that is occupied by the rats and find all of their holes in the ground. Into these holes is placed a small quantity of carbon bisulphide. This chemical is very volatile and quickly transforms into a heavy poisonous gas that permeates the entire atmosphere and generally kills every living organism with which it comes in contact. This latter method may be of use in the Philippines, but as yet I have been able to find but few places where the rats live in holes in the ground. The great majority of them live, as before mentioned, in thickets, hollow logs, and débris piles; this is doubtless on account of the wetness of the rice fields. Should we at a later date find the rats living in holes this method will undoubtedly furnish the easiest and most economical way of reducing them. Other compositions received from different parts of the world have been tried and found to be unpalatable to the rats, as they will not eat them.

This Bureau has lately received a prescription from British India which is highly recommended by the inspector-general of the civil hospitals of that country. We are also awaiting the receipt of other formulas from the department of agriculture of Western Australia which have been successfully used against the rabbits in that State. The following is the Indian formula:

Yellow phosphorous, 15.0 kilos, at ₱7.50	₱112.50
Carbon bisulphide, 12.0 kilos, at 88 centavos	10.56
Lard oil or lard, 28.5 kilos, at 40 centavos	11.40
Brown sugar, 35 kilos at 22 centavos.....	7.70
Flour, 71.5 kilos, at 15 centavos	10.72
Flavoring essences, 5 kilos, at ₱5.....	25.00
Lamp black, 3.5 kilos, at 30 centavos	1.05
Ghi or butter, 60 kilos, at 88 centavos.....	52.80

On investigation I find that the ingredients for the above-mentioned composition can be secured in Manila in sufficient quantities to admit of the manufacture of the article for commercial purposes. The Bureau of Science has already undertaken the task of mixing several sample lots of this and other similar compositions. By the middle of August we expect to be again at work in the field and make a test regarding the efficiency of these preparations as rat exterminators, and we have reason to believe that some of them at least will be successful.

THE CROP-REPORTING SERVICE.

By W. D. HOBART, *Division of Statistics.*

A law passed by the Philippine Legislature at the last session providing for the preparation by municipal presidents of quarterly reports on crop and live-stock conditions in their municipalities is considered so important that it is quoted in full, as follows:

ACT No. 1898.—An Act providing that municipal presidents shall make special quarterly reports on the condition of agriculture, live stock, and on other matters in their respective municipalities.

By authority of the United States, be it enacted by the Philippine Legislature, that:

SECTION 1. The presidents of the municipalities created in accordance with Act Numbered Eighty-two shall make quarterly reports of the condition of agriculture and live stock in their respective municipalities, and of such other matters as relate to their development, based upon the following particulars:

(a) Whether any kind of crop has been damaged by excessive rain, drought, or wind, and upon what date;

(b) Whether any crop has been damaged by insects such as locusts, and so forth, or by reason of any disease, and when;

(c) The names of the five most important crops grown in the municipality;

(d) The names of some of the crops of lesser importance grown in the municipality;

(e) Condition of live stock: (1) number of horses, cattle, carabaos, hogs, goats, and sheep; (2) increase during the quarter; (3) decrease during the quarter; (4) number of cases of disease; (5) number of deaths; (6) nature of the disease; and (7) remarks.

(f) (1) The total number of hectares sown prior to the beginning of the quarter, with the following products: palay, hemp, maguey, cocoanuts (number of trees), sugar cane, tobacco, maize, coffee, and cacao; (2) the hectares sown during the quarter with the said plants; (3) the state or condition of the crops; (4) the number of hectares which were productive during the quarter (for cocoanut trees, the number of cocoanuts); (5) the total quantity harvested during the quarter; (6) the average production per hectare (for cocoanuts, the quantity of cocoanuts to the tree); (7) the quantity of such products then remaining in the possession of the owners of the crops and local dealers, according to the measurement and weight specified in the fifth number of this paragraph; (8) the value, at the date of the report, of each one of the said products, according to the measurement and weight specified; and (9) remarks.

SEC. 2. The report so made shall be submitted to the municipal council, and, if approved, a copy thereof shall be forwarded to the office of the provincial

governor, a second copy to the Delegate from the district, a third copy to the Bureau of Agriculture, which shall furnish the necessary blank forms, and a fourth copy shall be filed in the office of the municipal secretary.

SEC. 3. The Bureau of Agriculture shall make a summary of the reports received from the municipalities, as provided in this Act, which shall be incorporated in the monthly review published by the said Bureau.

SEC. 4. This Act shall take effect on its passage.

Enacted, May 17, 1909.

It will be seen that the Bureau of Agriculture is to furnish the blank forms to be used; and from the reports it receives from all of the municipalities is to make a summary which will be published in the PHILIPPINE AGRICULTURAL REVIEW.

Since the inauguration of the crop-reporting service in these Islands, for which funds were made available for expenditure by this Bureau three years ago, monthly reports have been received from voluntary correspondents. Approximately one-half of these correspondents have been municipal presidents and one-half private individuals. Many of the correspondents have taken great pains to make their reports as accurate as possible and deserve the thanks of all. Others, however, have not given the attention to the work which such an important matter deserves.

The new law, it will be seen, originated in the Philippine Assembly and shows how important that representative body, with their knowledge of conditions all over the Islands, considered the preparation of accurate statistics of crops and live stock. They believed the best results could be obtained by putting this work into the hands of municipal presidents.

It is confidently expected by this Bureau that the change of reports from monthly to quarterly, which gives more time for their preparation, will result in greater accuracy. Another advantage over the former system is that presidents will be able to obtain the coöperation of the councilors, *tenientes* of barrios, and, it is hoped, the continued service of those private individuals who have heretofore done such good work on the reports which were formerly made direct to this Bureau.

As it is believed that the Bureau should always be in touch with municipal officials and familiar with the general conditions of crops and live stock, a form has been prepared and will be sent to all municipal presidents covering the first two months of each quarter, asking for general information as to whether crops have been damaged from any unusual cause, the general condition of growing crops, local prices, and cases of sickness and death of farm animals.

In conclusion, correct agricultural statistics have an importance which is universally recognized. If municipal officials and all who realize the great benefits to be derived from them will heartily coöperate with municipal presidents, whose reports are the basis of the statistics to be made up by this Bureau, the whole country will be the gainer. In no

other way than by prompt and accurate reports on the condition of crops and live stock can the Government and the farmers coöperate for the immediate suppression of the enemies of our staple crops. By means of such reports we may all learn little by little those conditions under which the largest and best crops can be produced on a given area of land. Only when the farmers and municipal officials become interested and enthusiastic—in fact, serious—regarding this matter can the Government and the people of these Islands make any considerable progress in agricultural development.

THE TENSILE STRENGTH OF MACHINE AND HAND STRIPPED ABACA FIBER.¹

By RAYMOND F. BACON.

Promoters of hemp-stripping machines have from time to time maintained that the hand-stripped fiber is not so strong as machine-stripped hemp. It is of considerable importance to the Manila hemp industry to substantiate these claims, as there seems to be little doubt that in a few years a large part of the abaca leaves will be stripped by machines, and if the machine-stripped hemp is stronger than the hand-stripped variety, the whole Manila hemp industry will be very materially benefited. The present active competition which Manila hemp must meet with the sisal and maguey fibers is largely due to the fact that these latter are machine-stripped, and consequently more uniform and stronger than retted or hand-stripped fibers of the same species.

I have made tests on the comparative tensile strength of machine and hand-stripped abaca fibers. In the first series of tests, stalks from the same plantation of the same age were selected at random, one-half were stripped on the machine and one-half by hand. The latter represented the best grade of hand-stripping, with a smooth-edged knife, and the resulting hemp was much cleaner than that usually found in the market. While the above method of selection would not be rigid without a very large number of tests, still the results obtained so markedly and uniformly point in the same direction that little doubt is left as to the relative strength of the fibers. In making the tests, ten fibers at one time were twisted together and the number of kilos necessary to break them measured with a Riehle testing machine. Fifty lots of ten fibers each of hand and machine stripped hemp of the same length were then weighed to obtain the average weight of the fibers, so that any differences in breaking strain could not be ascribed to different sizes of the fibers used. An arbitrary strength factor X was then calculated, representing the breaking strength divided by the weight of the fibers. The results of the first series of tests are presented in Table I.²

¹ From *The Philippine Journal of Science*, Vol. IV, No. 2, March, 1909.

² These tests were made possible through the kind coöperation of Mr. M. A. Clarke, the machine used being that of the Manila Hemp Machine Company.

TABLE I.

Class of fiber.	Breaking strength in kilos.	Class of fiber.	Breaking strength in kilos.
Mindoro machine-stripped	21.4	Davao machine-stripped	31.4
Do	23.8	Do	33.6
Do	24.0	Do	31.0
Do	22.6	Do	34.5
Do	*34.0	Mindoro hand-stripped	14.5
Do	24.1	Do	18.6
Do	25.0	Do	16.3
Do	21.8	Do	14.1
Do	24.5	Do	*20.4
Do	26.9	Do	14.5
Do	22.3	Do	15.4
Do	27.6	Do	14.1
Do	28.1	Do	12.7
Davao machine-stripped	32.6	Do	17.7
Do	34.0	Do	13.2
Do	35.5	Do	14.1
Do	40.5	Do	15.4

* Picked samples.

The averages for the first series of tests are as follows:

Class.	Number of determinations.	Breaking strength in kilos.	Average weight of 10 fibers in grams.	Strength factor, X.
Mindoro machine	13	25.3	0.0509	50
Mindoro hand	13	15.4	0.0510	30
Davao machine	9	35.4	0.0716	48

In the second series of tests each leaf was split into two parts, one half was stripped by machine and the other half by hand. This lot of hemp was from Albay Province. The numbers opposite each other represent the same leaf, and hence are comparable. The results are presented in Table II.

TABLE II.

Breaking strength in kilos.		Breaking strength in kilos.	
Machine-stripped.	Hand-stripped.	Machine-stripped.	Hand-stripped.
26.8	11.4	17.8	11.8
19.9	14.0	19.5	10.9
23.4	14.4	21.8	18.2
22.3	10.9	20.9	7.2
21.0	11.4	27.3	11.8
23.1	10.9	16.8	11.4
26.4	13.2	16.8	11.8
19.1	8.6	* 21.0	* 12.2
16.8	11.8		
15.0	8.6		

* Averages.

The average weight of the two classes of fibers in this last series was the same, so that their relative tensile strength is correctly given by the average breaking strain.

Many other determinations with the same results have been made. There is little doubt that the machine-stripped fiber is considerably stronger than the hand-stripped variety. To give a reason for this difference is another matter. Examination under the microscope showed that both classes of fiber were quite clean and revealed no differences between them. It is my opinion that the difference is due to the continuous, steady pull of the fiber under the machine's knife as compared to the intermittent jerky pull which is necessary in hand stripping. The jerks of the hand-stripper strain the fibers so as very markedly to lower their tensile strength. Confirmatory evidence for this theory is given by the fact that hand-stripped hemp shows very many broken fibers, so that a bundle of this class of abaca consists of a series of shorter and longer fibers, while the machine-stripped abaca has practically no fibers broken and all are of the same length. The advent of the hemp-stripping machine should very materially advance the quality of Manila hemp.

THE AMENDED HOMESTEAD LAW.

By C. H. SLEEPER, *Director of Lands.*

At its inaugural session the Philippine Legislature passed Act No. 1864, amending Chapter I of Act No. 926, the Public Land Act, relating to homesteads on the public domain. According to the provisions of law this amendment could not become effective until approved by the President and the Congress of the United States. The Act was approved by the President, and as Congress took no action the Act became a law as provided in section 13 of the Act of Congress dated July 1, 1902, and was proclaimed in the Philippine Islands by the Governor-General on June 21, 1909.

This amendment differs from the original Act in two important particulars; *first*, in the method of paying the required fees, and *second*, in the length of residence on the homestead by the applicant.

In the original Homestead Act a fee of ₱10 was required when the application for homesteads was approved, and ₱10 additional when the final proof was submitted. Final proof, which may be submitted at the expiration of five years after date of application, and must be submitted within eight years after date of application, consists of the affidavits of two witnesses that the applicant has resided upon and cultivated the land for the required number of years, and an affidavit that the land has not been sold or mortgaged, and that the applicant has borne true allegiance to the Government of the United States and the Philippine Islands. The amendment gives the applicant the option of paying the fees in the manner provided in the original Act or paying the same in installments of ₱4 each year, the first payment to be made upon approval of the application for a homestead.

The land must be cultivated for a period of five years from the date of filing the application, but the applicant must actually reside upon the land for two years immediately preceding the date of filing his final proof, while the original Act required a residence of five years. If the applicant elects to pay the fees for the homestead in installments, they may be paid to the municipal or provincial treasurer or to the Director of Lands. If, however, he fails to pay any installment within thirty days after it becomes due, all rights are lost and the applicant forfeits any installments which he may have previously paid. If the applicant

voluntarily abandons the land for more than six months at any one time during the two years' residence thereon, his entry is subject to cancellation by the Director of Lands at his discretion. A homestead entry may also be canceled if it is discovered that the applicant is not qualified to acquire a homestead or if he fails to cultivate the land as required by law, or if it is proven that the land which he has applied for is not open to homestead settlement.

The evident intention of the amendment to the Homestead Law was to encourage the very poorest class of people to take up homesteads and to grant such a period of time for the payment of the fees that anyone can make the payments, and to allow those who take up homesteads to cultivate their lands through agents while they are engaged in other occupations until such time as the land shall produce crops, when the applicant must reside thereon for two years prior to the submission of the final proof.

ESTIMATED COST AND PROFIT FROM PARA RUBBER CULTIVATION IN THE FEDERATED MALAY STATES.¹

ESTIMATE FOR 1,000-ACRE ESTATE; 250 TO BE OPENED
EACH YEAR.²

FIRST YEAR.

Premium	\$3,000
Survey fees	1,000
Rent	1,000
Clearing, felling, and burning 250 acres (\$15 per acre)	3,750
Lining, holing, and planting 250 acres (\$6 per acre)	1,500
Plants	800
Roads and drains (\$6 per acre)	1,500
Bungalow	2,000
Lines	1,500
Medical—hospital, medicines, etc.	2,000
Labor—advances, immigration fees, etc.	1,500
Superintendence	3,600
Tools and sundries	1,000
Total	24,150

SECOND YEAR.

Rent	\$1,000
Clearing, felling, and burning 250 acres	3,750
Lining, holing, and planting 250 acres	1,500
Plants	800
Roads and drains	1,500
Medical	1,000
Labor	1,000
Superintendence	4,000
Tools and sundries	750
Weeding 250 acres	2,500
Supplying	100
Total	17,900

¹ From Agricultural Bulletin of the Straits and Federated Malay States, Vol. VIII, No. 5.

² Stated in Federated Malay States currency.

THIRD YEAR.

Rent	\$1,000
Clearing, felling, and burning 250 acres	3,750
Lining, holding, and planting 250 acres	1,500
Plants	800
Lines	1,500
Roads and drains	1,500
Medical	1,000
Labor	1,000
Superintendence	4,000
Tools and sundries	1,000
Weeding 500 acres	6,000
Supplying	100
Total	23,150

FOURTH YEAR.

Rent	\$1,000
Clearing, felling, and burning 250 acres	3,750
Lining, holding, and planting 250 acres	1,500
Plants	800
Roads and drains	1,500
Medical	1,000
Labor	1,000
Superintendence	4,000
Tools and sundries	1,000
Weeding 750 acres	12,000
Supplying	100
Total	27,650

FIFTH YEAR.

Rent	\$1,000
Roads and drains	800
Medical	1,000
Labor	1,000
Superintendence	4,000
Tools and sundries	1,000
Weeding, 1,000 acres	15,000
Total	23,800

SIXTH YEAR.

Rent	\$1,000
Roads and drains	800
Labor	1,000
Medical	1,000
Superintendence	4,000
Tools and sundries	1,000
Weeding 1 000 acres	17,000
Total	25,800

SEVENTH YEAR.

Rent	\$4, 000
Roads and drains	800
Medical	1, 000
Labor	1, 000
Superintendence	4, 000
Tools and sundries	1, 000
Weeding 1,000 acres	17,000
Total	28, 800
Eighth and following years as seventh year	\$28, 800

With the exception that the cost of weeding gradually decreases till in the eleventh year it is practically nil.

PROFITS.¹

SEVENTH YEAR.

250 acres, planted 150 trees per acre, at 1 pound rubber per tree, sold at 3 shillings per pound	\$48, 214
250 acres, planted 150 trees per acre, at 1½ pounds rubber per tree.....	72, 321
Total	120, 535
Less cost of production, shipping, etc., of 93,750 pounds, at 1 shilling 6 pence per pound	60, 268
Net profit	60, 267

EIGHTH YEAR.

250 acres, at 1 pound per tree and 3 shillings per pound	\$48, 214
250 acres, at 1½ pounds per tree and 3 shillings per pound	72, 321
250 acres, at 2 pounds per tree and 3 shillings per pound	96, 428
Total	216, 963
Less costs of production, etc., 253,125 pounds, at 1 shilling 6 pence per pound	108, 482
Net profit	108, 481

NINTH YEAR.

250 acres, at 1 pound per tree and 3 shillings per pound	\$48, 214
250 acres, at 1½ pounds per tree and 3 shillings per pound	72, 321
500 acres, at 2 pounds per tree and 3 shillings per pound	192, 856
Total	313, 391
Less cost of production, etc., 243,750 pounds, at 1 shilling 6 pence per pound	156, 696
Net profit	156, 695

¹ Stated in Federated Malay States currency.

TENTH YEAR.

250 acres, at 1½ pounds per tree and 3 shillings per pound	\$72,321
750 acres, at 2 pounds per tree and 3 shillings per pound	289,280
Total	361,601
Less cost of production, etc., 262,500 pounds, at 1 shilling 6 pence per pound	180,800
Net profit	180,801

ELEVENTH YEAR.

1,000 acres, at 2 pounds per tree and 3 shillings per pound	\$385,710
Less cost of production, etc., of 300,000 pounds, at 1 shilling 6 pence per pound	192,857
Net profit	192,853

And so on each year, annual profit \$192,853, with a probability of still increased yield.

Abstract of profit and loss.¹

Year.	Expenditure.	Profit on rubber.	Net profit on estate.
First.....	\$24,150		
Second.....	17,900		
Third.....	23,150		
Fourth.....	27,650		
Fifth.....	23,800		
Sixth.....	25,800		
Seventh.....	28,800	\$60,267	\$31,467
Eighth.....	28,800	108,481	79,681
Ninth.....	28,800	156,695	127,895
Tenth.....	28,800	180,801	152,000
Eleventh.....	28,800	192,853	164,053
Twelfth.....	28,800	192,853	164,053

Expenditure with interest at 5 per cent, up to end of sixth year, \$168,670 (£20,000).

Net profit on estate after deducting 5 per cent interest on capital:

Expended seventh year, \$22,967, or 13 per cent; eighth year, \$71,181, or 42 per cent; ninth year, \$119,395, or 70 per cent; tenth year, \$143,500, or 84 per cent; eleventh year, \$156,553, or 92 per cent.

And so in future years with a probability of increased yields.

Capital expended, \$168,670 (£19,678 3s. 4d.).

Profit, \$22,967 (£2,679 9s. 8d.); \$71,181 (£8,304 9s. 0d.); \$119,395 (£13,929 8s. 4d.); \$143,500 (£16,741 13s. 4d.); \$156,355 (£18,241 8s. 4d.).

¹ Stated in Federated Malay States currency.

PHILIPPINE HEMP STATISTICS.¹

HEMP RECEIPTS AND EXPORTS, 1901-1908, AND MONTHLY RECEIPTS, 1908.

Hemp receipts, 1901-1908.

[In piculs.]

Provinces.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Albay	547,096	545,941	527,171	591,354	521,658	406,038	479,879	548,194
Sorsogon	190,764	172,640	281,957	210,878	212,184	157,072	231,912	198,786
Leyte	259,803	258,478	289,802	241,461	246,016	266,100	349,245	144,594
Samar	18,804	86,983	165,605	121,551	106,364	93,788	166,420	318,059
Camarines	158,876	170,401	182,835	162,736	173,108	147,390	132,264	179,283
Mindanao	81,910	68,706	33,940	42,574	51,210	55,320	74,816	93,742
Other districts	33,830	46,677	82,963	60,041	89,228	58,314	61,822	42,271
Cebu	62,343	84,564	129,092	72,630	59,834	32,866	17,960	29,975
At Manila	1,353,426	1,434,390	1,693,365	1,503,225	1,459,602	1,211,888	1,514,418	1,554,904
At Cebu	192,720	364,666	314,727	306,048	350,556	156,427	428,698	549,350
Grand total	1,546,146	1,799,056	2,008,092	1,809,273	1,810,158	1,368,315	1,943,116	2,104,254

Hemp exports, 1901-1908.

[In bales.]

Countries.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
United States	186,707	399,099	465,318	341,408	400,193	399,822	344,979	384,330
Great Britain	653,822	380,161	451,103	433,284	359,249	310,890	396,014	437,710
California	24,802	34,436	63,512	88,784	85,392	54,282	54,969	84,854
Australia	15,784	9,927	14,564	61,158	55,419	11,128	13,710	16,518
Other parts	32,234	22,897	55,468		-----	42,979	78,008	100,732
Total exports	913,349	846,520	1,049,965	924,634	900,253	819,091	887,670	1,024,144

¹ From the report of the committee of the Manila Chamber of Commerce for the year ending December 31, 1908.

Monthly hemp receipts, 1908.

[In piculs.]

Provinces.	January.	February.	March.	April.	May.	June.
Albay -----	41,884	39,402	58,712	29,442	38,056	41,532
Sorsogon -----	14,644	21,398	14,770	10,954	10,094	12,756
Camarines -----	9,776	12,114	9,584	13,600	11,128	13,188
Leyte -----	27,149	27,696	28,006	19,944	20,601	25,140
Samar -----	6,578	13,254	16,930	19,962	13,897	10,300
Mindanao -----	1,025	6,756	5,334	8,810	7,082	5,588
Other districts -----	2,640	4,128	3,612	2,596	2,446	2,724
Cebu -----	2,820	1,268	1,798	288	1,080	5,996
Total at Manila -----	106,516	126,016	138,746	105,596	104,384	117,224
Total at Cebu -----	22,008	46,970	62,208	46,236	37,560	48,806
Grand total -----	128,524	172,986	200,954	151,832	141,944	166,030

Provinces.	July.	August.	Septem-ber.	October.	Novem-ber.	Decem-ber.	Total.
Albay -----	45,638	45,778	45,400	62,334	45,796	54,220	548,194
Sorsogon -----	15,938	27,450	16,452	22,012	15,606	16,712	198,786
Camarines -----	15,458	9,574	13,412	12,246	11,242	13,272	144,594
Leyte -----	24,670	25,269	26,910	28,620	26,825	37,229	318,059
Samar -----	16,616	10,529	16,784	13,598	18,547	22,288	179,283
Mindanao -----	7,016	6,959	9,400	12,626	13,046	10,100	93,742
Other districts -----	2,854	3,844	4,612	5,294	4,086	3,435	42,271
Cebu -----	3,682	2,211	3,010	138	1,208	6,476	29,975
Total at Manila -----	131,872	131,614	135,980	156,868	136,356	163,732	1,554,904
Total at Cebu -----	34,350	50,738	44,040	47,862	59,916	48,656	549,350
Grand total -----	166,222	182,352	180,020	204,730	196,272	212,388	2,104,254

PHILIPPINE SUGAR STATISTICS.¹

SUGAR EXPORTS, BY PORTS AND COUNTRIES, 1898-1908.

Comparative statement of sugar exports, by ports, 1898-1908.

[In piculs.]

	1898.	1899.	1900.	1901.	1902.
Manila -----	251,169	80,374	404,813	68,523	7,017
Cebu -----	159,469	210,780	51,986	126,604	71,372
Iloilo -----	2,449,023	1,197,700	540,078	691,261	1,394,771
Total -----	2,859,661	1,488,854	996,827	886,388	1,473,160

	1903.	1904.	1905.	1906.	1907.	1908.
Manila -----	5,204	68,378	56,480	308,523	313,736	664,658
Cebu -----	59,486	24,856	34,641	14,946	48,011	63,426
Iloilo -----	1,332,263	1,213,272	1,588,771	1,666,671	1,590,556	1,460,991
Total -----	1,432,953	1,306,506	1,679,892	1,990,140	1,952,303	2,189,075

Comparative statement of sugar shipments to different countries, 1898-1908.

[In piculs.]

	1898.	1899.	1900.	1901.	1902.
Great Britain -----	675,670	132,792	203,970	-----	99,468
United States and Canada -----	520,752	353,680	33,600	81,600	40,800
Continent of Europe -----	2,887	164,033	-----	-----	-----
China and Japan -----	1,660,352	838,349	759,257	804,788	1,332,892
California -----	-----	-----	-----	-----	-----
Total -----	2,859,661	1,488,854	996,827	886,388	1,473,160

	1903.	1904.	1905.	1906.	1907.	1908.
Great Britain -----	-----	69,600	8,000	-----	186,600	171,680
United States and Canada -----	540,880	334,288	686,877	-----	139,200	728,000
Continent of Europe -----	892,073	902,618	985,015	1,802,617	1,594,479	1,289,395
China and Japan -----	-----	-----	-----	187,623	32,024	-----
California -----	-----	-----	-----	-----	-----	-----
Total -----	1,432,953	1,306,506	1,679,892	1,990,140	1,952,303	2,189,075

¹ From the report of the committee of the Manila Chamber of Commerce for the year ending December 31, 1908.

PHILIPPINE COPRA STATISTICS.¹

COPRA EXPORTS, BY PORTS AND COUNTRIES, 1898-1908.

Comparative statement of copra exports, by ports, 1898-1908.

[In piculs.]

	1898.	1899.	1900.	1901.	1902.
Manila	252,840	215,819	982,647	488,602	647,875
Cebu	10,562	66,282	41,080	45,077	72,772
Iloilo		9,221			
Total	263,402	291,322	1,023,727	533,679	720,647

	1903.	1904.	1905.	1906.	1907.	1908.
Manila	1,035,014	547,955	699,336	738,433	578,829	1,123,326
Cebu	226,971	66,176	140,984	189,500	265,488	311,840
Iloilo					592	
Total	1,261,985	614,131	840,320	927,942	844,909	1,435,166

Comparative statements of copra exports to different countries, 1898-1908.

[In piculs.]

	1898.	1899.	1900.	1901.	1902.
Great Britain	12,180	47,704	48,882	9,095	59,200
Continent of Europe	248,655	246,366	970,888	522,665	651,971
United States					
China, etc	2,567	252	3,957	1,919	9,476
Total	263,402	291,322	1,023,727	533,679	720,647

	1903.	1904.	1905.	1906.	1907.	1908.
Great Britain	86,400	14,400	25,840	13,200	29,312	8,800
Continent of Europe	1,171,209	597,599	810,114	908,722	781,398	1,367,281
United States	2,656	1,600		6,000	33,399	59,085
China, etc	1,720	532	4,336	20	800	
Total	1,261,985	614,131	840,320	927,942	844,909	1,435,166

¹ From the report of the committee of the Manila Chamber of Commerce for the year ending December 31, 1908.

LONDON COPRA RECEIPTS.¹

COPRA RECEIPTS, BY COUNTRIES, 1896-1908, AND BY MONTHS, 1908

Shipments from different countries, 1896-1908.

[London, February 26, 1909.]

[In tons.]

Year.	Java.	Macassar.	Sangir, Menado, and Gorontalo.	Padang.	Singapore and Penang.	Ceylon.	Manila.	Total.
1896.....	19,511	8,770	6,000	5,778	39,440	3,677	33,468	116,644
1897.....	5,630	4,076	4,000	2,678	30,000	7,831	46,290	101,098
1898.....	3,086	8,226	6,000	5,515	35,363	37,192	15,094	110,476
1899.....	46,011	12,012	10,486	3,900	52,182	23,905	12,253	160,749
1900.....	35,257	13,982	10,296	5,487	28,214	18,059	57,361	168,656
1901.....	27,688	12,151	10,482	4,737	26,111	21,916	28,854	131,989
1902.....	45,129	28,045	17,698	5,364	50,490	18,740	45,080	210,496
1903.....	15,406	9,799	11,658	6,231	52,420	34,713	78,874	209,096
1904.....	29,716	9,125	11,746	6,120	42,070	33,578	38,383	170,738
1905.....	107,709	25,961	19,514	6,580	58,915	17,740	49,715	286,134
1906.....	52,000	9,641	14,481	6,638	39,215	21,212	57,900	201,087
1907.....	69,666	17,248	16,080	8,694	55,120	16,898	53,631	237,237
1908.....	94,740	21,591	12,047	11,927	76,550	36,457	89,698	355,010
Total	551,549	180,627	150,483	79,649	586,683	291,918	606,451	2,459,350

Monthly receipts for 1908.

Month.	Java.	Macassar.	Sangir, Menado, and Gorontalo.	Padang.	Singapore and Penang.	Ceylon.	Manila.	Total.
January	10,376	1,384	1,420	1,189	7,060	400	6,000	27,829
February	6,917	1,665	1,235	864	3,830	971	1,250	16,732
March	6,485	1,118	1,606	1,045	4,835	1,848	7,500	24,437
April	4,385	1,380	1,791	321	4,610	2,449	4,000	18,936
May	6,917	1,437	2,717	597	7,155	450	5,000	24,273
June	8,585	2,669	2,470	823	7,835	1,814	9,000	33,196
July	8,585	1,297	2,038	919	7,840	1,816	4,350	26,845
August	7,411	2,603	1,976	1,725	9,670	2,613	9,750	35,748
September	11,425	1,820	2,162	1,351	9,055	6,918	7,250	39,891
October	7,720	2,148	2,409	1,278	7,015	4,869	12,750	38,189
November	6,670	2,295	2,223	808	4,645	6,455	11,000	34,096
December	9,264	1,775	2,000	1,007	3,000	5,854	11,848	34,748
Total	94,740	21,591	24,047	11,927	76,550	36,457	89,698	355,010

¹ From the report of the committee of the Manila Chamber of Commerce for the year ending December 31, 1908.

PHILIPPINE TOBACCO STATISTICS.¹

SHIPMENTS OF LEAF TOBACCO, 1898-1908.

*Comparative statement of shipments of leaf tobacco to different countries,
1898-1908.*

[In quintals.]

	1898.	1899.	1900.	1901.	1902.
Great Britain -----	21,893	20,845	338	2,042	4,412
United States -----	312			53	1,138
Continent of Europe -----	143,153	89,094	185,013	169,770	179,432
China, etc -----	9,812	4,322	3,017	5,678	4,384
Total -----	175,170	114,261	189,368	177,543	189,366

	1903.	1904.	1905.	1906.	1907.	1908.
Great Britain -----	10,140	7,668	2,337	11,874	14,224	863
United States -----	88			1,310		
Continent of Europe -----	170,642	154,376	154,371	241,210	195,200	217,432
China, etc -----	3,129	3,754	5,236	22,647	12,660	6,329
Total -----	183,999	165,798	161,944	277,041	222,084	224,624

¹ From the report of the committee of the Manila Chamber of Commerce for the year ending December 31, 1908.

CURRENT NOTES.

THE COLLEGE OF AGRICULTURE.

With the opening of the new school year by the Bureau of Education began one of the very best enterprises for promoting practical and economic education in these Islands, namely, the Philippine College of Agriculture at Los Baños, La Laguna Province, under the direction of Dr. E. B. Copeland. Doctor Copeland is assisted in his work by Mr. Harold V. Cuzner, formerly horticulturist in this Bureau, as agriculturalist, Mr. E. M. Ledyard, formerly teacher of nature study and animal life in the Manila High School, as zoölogist, and Mrs. E. M. Ledyard, who has charge of the language work in the college. Between 50 and 60 students have enrolled; they will at first be housed in tents, where they will live until the necessary buildings which they themselves will erect have been completed. It is anticipated that the building fund provided by the Bureau of Education for a School of Agriculture at Los Baños will be made over to the University of the Philippines for the first buildings of the College of Agriculture. A definite site or university center has not yet been secured by the Board of Regents. The organic Act, however, provides that such site should be in the city of Manila. The site of the college contains about 75 hectares of good land on the lake shore beyond Los Baños. Part of this land is low and the remainder is high, so that diversified farming can be carried on. For admission to the College of Agriculture, the applicant must have completed a course of study equivalent to the primary and intermediate courses as given in the public schools and the first year of the secondary course. In default of these requirements the applicant will be required to pass an examination given by the faculty of the college.

It is the intention of Doctor Copeland and his associates to take up extension work among farmers as soon as possible and to have short courses at the college for them.

THE COLLEGE OF VETERINARY SCIENCE.

Act No. 1870 of the Philippine Legislature, enacted June 18, 1908, which provided for establishing the College of Agriculture of the University of the Philippines, also provided for the College of Veterinary Science to be located at Manila on the site of the animal quarantine station at Pandacan; suitable buildings have been authorized, including an animal hospital, dissecting room, and an instruction laboratory. The

College of Veterinary Science opened its first session on Monday, June 14, at the Philippine Medical School.

For admission to the College of Veterinary Science the requirements will be similar to those for admission to the Philippine School of Medicine and will presuppose the completion of the fourth year secondary, high school course, as given in the public schools. In default of these requirements or in case the candidate comes from a private institution he will be required to pass the Medical College entrance examination.

THE INSULAR LUMBER COMPANY.

Doubtless one of the first industries in the Philippines is that of the Insular Lumber Company at Sagay, at the north end of the Island of Negros. It is said that this company has invested ₱1,000,000 and that it is doing much toward supplying the local market with Philippine woods, which otherwise would be supplied with Oregon pine and California redwood. In addition to supplying the Philippine market, two of the largest timber markets in the Far East, Australia and China, which consumed not less than 156,000,000 feet of Oregon pine and California redwood last year, are open to timber from Philippine forests.

PHILIPPINE FORESTS.

From the following report by the Director of Forestry it will be seen that the Philippine forests are sixth in the list of available forest lands.

State.	Forest area (hectares).	Cost per hectare.	Net revenue per hectare.	Number of forest- ers.	Number of rangers and guards.	Total expenses.	Net revenue.
Germany and Prussia	2,465,000	₱6.90	— ₱6.30	806	3,739	₱17,000,000	₱15,776,000
India	19,000,000	.45 +	.39 +	312	9,203	8,532,000	7,416,000
Java	2,700,000	.64	.61 —	30	1,000	1,728,000	1,628,000
Japan	12,000,000	.08 +	.16 +	325	1,434	1,000,000	2,000,000
Philippine Islands*	6,000,000	.018 +	.016 +	9	25	110,000	100,000

*There are 16,000,000 hectares of public forests, only 6,000,000 of which are being exploited.

THE BEETLE PEST.

According to Dr. E. B. Copeland, dean of the Philippine Agricultural College at Los Baños, beetles are at this time probably our most dangerous and destructive agricultural pest. Doctor Copeland believes that beetles are far more destructive to coconut trees in the Philippines than typhoons. Writing on this subject in the December number of the Philippine Journal of Science, Doctor Copeland suggests that there should be legislation for the purpose of securing the total suppression of this pest, as has been done in other countries. He says, "The Provinces of La Laguna and Tayabas have passed ordinances against a local coconut pest, the bud rot, and have very promptly reduced it to comparative harmlessness, but single provinces can not deal effectively with beetles. The Straits

Settlements, the Federated Malay States, and Ceylon have for years had laws aimed at the suppression of beetles, and their value is well proved. Coconut products are second only to abaca in the value of exports of the Philippines. The beetles are probably at this time our most dangerous and most destructive agricultural pest."

PHILIPPINE TERPENES AND ESSENTIAL OILS.

A general survey of the field of terpenes and essential oils in the Philippines made by Dr. Raymond F. Bacon of the Bureau of Science, has demonstrated the fact that a profitable business can be worked up in the collection of some of those existing in this country which have a commercial value in the United States and foreign countries. Doctor Bacon has collected over 100 specimens of *elemi* or resins in several different localities.

THE DIVISION OF ANIMAL INDUSTRY OF THE BUREAU OF AGRICULTURE.

The division of animal industry of the Bureau of Agriculture divided the Islands into two districts, and provision has been made for two traveling veterinarians, namely, Dr. S. Youngberg and Dr. R. F. Knight, as district veterinarians. Doctor Youngberg has been appointed chief veterinarian of the first district, which embraces all the provinces in the Island of Luzon and the adjacent islands south to the Visayas. Doctor Knight has been appointed chief veterinarian for the second district, which includes Panay, Negros, Cebu, Leyte, Samar, and the islands to the south. In case of serious outbreaks of any animal disease in the future, the district veterinarian will take personal charge of the campaign, and every veterinarian, inoculator and temporary employee of the district will be required to submit reports, and it will be the duty of the chief veterinarian to secure data on the results of inoculations and other methods used in combating animal diseases.

PHILIPPINE SPONGE FISHERIES.

According to the fishery expert of the Bureau of Science, Mr. Alvin Seale, the past year has marked the opening of the Philippine sponge fisheries from a commercial standpoint. Some 30,000 sponges were shipped from the Islands during the past year. The greater part of these were sold in Singapore for export to London. Samples of these sponges were taken to the United States Bureau of Fishery, where they were compared with specimens from Florida, Cuba and the Mediterranean. Samples were also taken to the wholesale sponge dealers in New York and San Francisco, who examined them with a great deal of interest.

PHILIPPINE COAL.

For the first time in history an Army transport, the United States Army transport *Dix*, on her last voyage homeward, left these Islands

with 2,500 tons of Philippine coal, mined on the Island of Batan, in her hold and bunkers. In case this experiment proves successful it will be possible to use Philippine coal instead of Japanese or Australian coal in so far as the Philippine mines are able to supply the demand.

DENATURED ALCOHOL.

From those informed on the subject, we understand that the owners of "nipales" or nipa plantations are very much interested in a law providing for the manufacture and sale of denatured alcohol free from internal-revenue tax. It is claimed that this commercial article which is used for heating and many other practical purposes can be made from the sap of the nipa palm and that in this way the factories in such sections as Capiz, Bulacan, and Pangasinan, which have been devoted to the making of native wines from nipa sap, could be diverted to the manufacture of denatured alcohol.

A PHILIPPINE BOTANICAL GARDEN.

The Director of the Bureau of Science in his last annual report calls attention to the need of a botanical garden in connection with the scientific and the economic study of plant life in these Islands which would be quite as valuable to the Bureaus of Agriculture and Forestry as to the Bureau of Science. He says: "Many, if not all, of the countries of the Far East have established botanic gardens either directly in their principal cities, or at least within easy reach of them. The importance of such botanic gardens to the economic development of the countries in question can not be doubted, and it is recommended that measures be taken at an early stage to establish a similar institution here." In connection with the above statement by the Director of the Bureau of Science it is desired to call attention to the fact that in every tropical country where a scientific study is made of the botany, agriculture, and forestry of the country, botanic gardens have been established and are one of the best means of studying the plant life of the country. As examples we call attention to the botanic gardens in Buitenzorg for the Dutch East Indies, in Singapore for the Straits Settlements and Federated Malay States, in Peradeniya for Ceylon and India, in Kingston, Jamaica, Bridgetown, Barbados, in Trinidad, and in practically every colony in the tropics where agriculture receives any considerable attention.

NOTES FROM OTHER FIELDS.

RICE INVESTIGATIONS IN INDO-CHINA.

According to the Bulletin Économique for March and April the agriculture service for Indo-China is actively carrying on an investigation and study of the different kinds of rice raised in Indo-China with the purpose of scientifically classifying the same. The improvement of the different varieties by the careful selection of seed is being diligently carried on. At the experiment station at Thanh-Ba a variety of rice from Italy is being cultivated side by side with a local variety of mountain rice known as "lua-ken-do." The soil was manured at the rate of 300 kilos of manure of the farm per are. All of the results of this trial have not yet been received by the director of agriculture, forestry, and commerce. At the experiment station at Phumy the local branch of the agricultural department of Cochin China has begun an experiment for the purpose of showing the value of sulphate of manganese on the yield of grain in the cultivation of rice. In the first series of experiments sulphate of lime was used at the rate of 90 kilos per hectare, and for the sulphuric acid 100 kilos of sulphate of manganese. In the second series of experiments 100 kilos of sulphate of manganese were applied to each hectare.

YLANG YLANG IN INDO-CHINA.

The agricultural service of Tonkin has been occupied in producing a sufficient number of plants of the *Cananga odorata* (ylang-ylang) to supply the demand for this plant from the planters of Tonkin. The nurseries of the Botanic Gardens in Hanoi are prepared to distribute more than 8,000 plants; these plants were produced from seeds obtained from trees in the botanical gardens in Hanoi, from seed received from Manila and from the Bureau of Agriculture of Cochin China. The seeds from the Botanic Garden in Hanoi seem to furnish a variety which is more regular and rapid in its growth than those obtained from other countries.

KAPOK IN INDO-CHINA.

According to the Bulletin Économique for March and April, the Cambodia branch of the department of agriculture, forestry, and commerce for Indo-China has begun an investigation concerning the kapok plantations in that country. Correspondence with several scientific establishments in Paris, with foreign countries and with the French

Chamber of Commerce has been begun with a view to preparing a statement regarding this very interesting industry. English machinery makers have also been addressed inquiring about machinery for the purpose of taking out the seed or ginning the fiber of the plant.

FOURTH SUGAR MILL FOR FORMOSA.

The Honolulu Iron Works have secured the contract for building a fourth sugar mill in Formosa for Japanese capitalists. It is stated that the sugar production of Formosa for the coming year will amount to about 80,000 tons. In the Philippine Islands there are very few modern or up-to-date sugar mills, and but one sugar refinery which has very little if any really modern machinery.

JAPAN'S SUGAR SUPPLY.

It is obvious that Japan has not hitherto depended alone on Formosa for her supply of sugar. Korea and Manchuria are at present only importers, but it is the intention of Japan to encourage the planting of the beet in Manchuria, and it is not at all impossible that in time that country may become one of the sources from which Japan will obtain sugar. Japanese supplies of the higher grades have hitherto come from Germany and Austria-Hungary, and from Russia until the commencement of the war. For the lower grades she draws upon Java, the Philippines, and Formosa. As there is no reason why the production of Formosa should not in time be quadrupled, it is possible that Formosa may eventually become the principal source of supply to Japan, and in that case the sugars to be first affected will be those imported from Java and the Philippines. In fact the Formosan centrifugals in the modern mills are already, to some extent, displacing the products of these two countries, more especially as regards Java. In view of the fact that Formosan sugars are admitted free of duty into Japan, it stands to reason that neither Java nor the Philippines will be able to compete, and must eventually give way as the exports from Formosa to Japan increase.

COCONUTS AND RICE IN THE STRAITS SETTLEMENTS.

In a letter received from Mr. Henry N. Ridley of the Botanic Gardens at Singapore, Straits Settlements, dated June 14, 1909, he makes the following statement:

Coconuts.—We have practically no disease except coconut beetles and one or two other insects which attack the foliage. Accounts of these have been published in the Agricultural Bulletin and the history of the coconut beetles in the Straits Branch of the Asiatic Journal, 1889. Nearly all of the industry is in the hands of natives who use no machinery. The nuts are husked with a large-bladed knife stuck in the ground. The ovens are very poor brick ovens with a fire inside; on the brick arch above the copra is dried in wet weather. The greater part is dried in the sun.

Rice.—There is a good deal of fancy as to the best rices grown here and some 80 or 90 kinds are all popular. The bulk of the rice consumed here comes from Bangkok and Rangoon. Practically nothing has been written on the local rice cultivation of any importance, except a few articles on padi pests in the Perak Museum Notes and Bulletin.

"BAGASSE" AS A PAPER PULP IN TRINIDAD.

Trinidad planters claim to have proven by successful experiments that sugar-mill owners can engage in the side manufacture of making paper out of "bagasse" or "magasse," as it is sometimes called. One mill owner has already built an \$85,000, United States currency, plant as an adjunct to his sugar mill, and paper worth \$24, United States currency, a ton has been turned out at this plant. It is reported that the process of manufacture is comparatively inexpensive, and that the paper alone will pay the expense of growing the sugar cane and running the mills, leaving the sugar as clear profit. In the Philippines as in Cuba it is believed that "bagasse" is worth more as fuel than as a pulp for paper-making purposes.

THE STUDY OF FOREST TREES BY THE UNITED STATES DEPARTMENT OF AGRICULTURE.

The Bureau of Forestry of the United States Department of Agriculture with the assistance of the teachers and pupils in the schools and other friends of the Bureau are obtaining data with reference to the *time of leafing, blossoming, and fruiting of the most important forest trees* of the United States. To do this, the Bureau has to depend largely upon the coöperation of a large number of volunteer observers. On request, the Bureau of Forestry furnishes forms upon which to record the data and a pamphlet containing full instructions as to the nature of the observations and how they are to be made. For educational purposes the results obtained for each species, averaged and presented graphically by means of colored charts, will be available to all who are interested in the subject, and particularly to schools. They will form virtual "tree calendars," and will be valuable aids to nature study. Such a work in the Philippines would not only be of great value to everyone interested in nature study and botany but to those interested in the study of the plant life of the Islands from an economic standpoint—to the Bureau of Agriculture and Forestry as well as to the Bureau of Science.

THE NATIONAL IRRIGATION CONGRESS.

The National Irrigation Congress of the United States will hold its seventeenth session in Spokane, August 9 to 14. In 1902, when the National Reclamation Act was passed, there were in the Government's name, in the 16 different States affected, 600,000,000 acres of arid land,

of which it was estimated that it would be possible to reclaim a sufficient amount to support 50,000,000 people. By 1911 the reclamation service will have reclaimed nearly 2,000,000 acres. The announcement of this congress, which is to be held during the present month, suggests the holding of a conference or congress of those interested in Philippine irrigation projects at the next Carnival.

EDIBLE FAT FROM COPRA.

German manufacturers are said to have succeeded in producing an excellent edible fat from copra, the meat of the coconut. The substance, which is known as "palmin," is used for cooking and is described as a hard, snow-white, vegetable fat of practically 100 per cent purity. While the process of manufacture was originally a secret, so many factories manufacturing similar lines have recently sprung up in Germany that it can no longer be so considered. The chief factory for the manufacture of "palmin" is at Mannheim; owing to its success the company has now put on the market a substitute for butter made from copra and called "palmona." The price of "palmin" is said to be less than that of other cooking fats and that of "palmona" much less than that of butter. The output of the factory, which amounts to between 20 and 25 million pounds a year, is usually sold far in advance.

THE DISTRIBUTION OF IMPROVED VARIETIES OF SEED.

The May number of the Queensland Agricultural Journal quotes from a bulletin issued by the director of the Kansas Agricultural College calling attention to the work being done in the United States in distributing improved seed wheat which has been very carefully tested. There were 3,995 bushels distributed to 638 farmers in 99 counties from the Manhattan station alone. The Fort Hays station distributed 3,980 bushels to 563 purchasers. In the same number, the Journal publishes rules for judging wheat and corn. This work suggests the careful trying out of the different kinds of rice, sugar, and tobacco raised in the Philippines, the publication of rules or standards of judging these plants and their products, and the distribution of the varieties found to be the best by the Bureau of Agriculture. At present comparatively little is known regarding the best varieties of rice, sugar, corn, hemp, and the other agricultural and economic plants of the Philippines, and it would seem that definite information on these subjects should be obtained as soon as possible.

CACAO IN SANTO DOMINGO.

The unprecedented export from Puerto Plata of 16,597,219 pounds of cacao in 1908 must be attributed to the development of the cultivation of the cacao bean, and to the suppression of the competitive conditions which in 1907 caused the deviation of large shipments to the port of Sanchez. Cacao is the most promising product of the Dominican Republic; the large extent of land suitable for its cultivation and the

continual efforts made by foreign as well as native planters afford ample assurance that the production of the country will soon place it in the second or third rank of the cacao-producing countries of the world. The average yield per annum of the trees is somewhat over 3 pounds, and on some plantations as high as 4 pounds, averages which compare most favorably with the results obtained in other countries where more scientific methods are used.

"MALVA." (MELOCHIA PIRAMIDATA.)

The Cuban Jute Company is the name of a new concern recently established at Habana with a capital of \$250,000, to work the "malva," a wild textile plant, producing a fiber said to be similar to the best Indian jute. The "malva" (*Melochia pyramidata*) grows abundantly in the island. The new company will devote itself to the manufacture of sugar sacks, for which the demand in Cuba is enormous, being calculated at a total value of about \$2,000,000. These sacks come at present from the waste products of the factory for paper making.

MANICOPA RUBBER IN JAMAICA.

In November, 1908, we received from the director of the Royal Gardens, Kew, 3,250 seeds of "jequié manicoba" (*Manihot dichotoma*) and 4,320 seeds "piahy manicoba" (*Manihot piahyensis*). Half of each kind of seed was sown at Hope Gardens, the other half being sown at Castleton Gardens. Some of the seeds of "jequié" germinated freely and we have now about 350 plants potted and ready for distribution.

The season for extracting the latex from the "jequié manicoba" extends from August to March. The latex possesses the valuable property of coagulating spontaneously when exposed to the air and requires no acid or other artificial coagulant of any kind. The market value of the two kinds of rubber, according to the rate of October 28, was for *M. piahyensis*, 7 shillings 6 pence per kilo; *M. dichotoma*, 8 shillings to 8 shillings 6 pence per kilo.

AGRICULTURAL CONDITIONS FOR THE MONTH OF MAY.

WEATHER CONDITIONS.

The weather conditions in different parts of the Islands during the past four weeks have been somewhat varied. The rains have been later this year than last; however, some portions of the Islands have received a considerable amount of rainfall, while in others the crops, especially rice and corn, are suffering from drought. Nevertheless, it may be said that agricultural conditions in general are improved.

IRRIGATION.

In some districts where there has been little rainfall the planters are realizing the benefits derived from irrigating their lands. In the northern part of Bulacan and southern Nueva Ecija the planters have made use of the water in wells and rivers to irrigate their lands before plowing, also in preparing their "semilleros" for seed, which has not yet been transplanted.

MISCELLANEOUS CROPS.

Rice.—During the month of May abundant crops of rice were harvested in the following provinces: Bulacan, Pampanga, Leyte, Nueva Ecija, Tayabas, Samar, Albay, Ambos Camarines, Sorsogon, Oriental Negros and Laguna, and in many of the municipalities of Isabela, Nueva Ecija, Ilocos Sur, and other provinces the "semilleros" were sown. So far the prospects for the rice crop are encouraging.

Corn.—A considerable amount of corn has been harvested in Leyte, Cagayan, and Cebu. The corn fields are in a very satisfactory condition in Cabadbaran, Agusan. In other parts of the Islands it is not possible to predict what the harvests will be; much depends upon the rainfall.

Sugar cane.—Reports from Pampanga, Tarlac, and Occidental Negros regarding sugar cane are promising, although locusts are causing a great deal of damage in the last-named province. A considerable amount of sugar has already been harvested in the municipalities of Sagay, Saravia, San Carlos, Cadiz, and La Carlota. The harvest of sugar cane in other provinces depends largely upon the rainfall. At present the fields are in good condition.

Hemp.—Large crops of hemp have been harvested in Leyte, Sorsogon, Albay, Ambos Camarines, and Tayabas. A report from Cabadbaran,

Agusan, states that the price of hemp rose for some time in that locality, which was a great encouragement to the planters, but it has since fallen, being worth only 9 centavos per kilo at the present time.

Tobacco.—Large harvests of tobacco have been gathered in Cagayan, Cebu, La Union, and Pangasinan.

AGRICULTURAL PESTS.

Locusts are at the present time the greatest plague of the planters, and every effort is being made to destroy them. They have caused great damage to the rice and corn fields, as well as to the sugar plantations in many of the provinces. Locusts have been more troublesome in Oriental Negros, Batangas, Cebu, and Bohol. Young locusts appeared in Victoria, Tarlac, in large numbers, but were destroyed before they did much damage to the crops. At Maragondon, Cavite, 250 cavanos of locusts were caught.

Information has been received from Ambos Camarines that rats have done some damage to the rice fields, and in some places the corn fields and sugar plantations.

ANIMAL DISEASES.

Animal diseases are still reported from Cagayan and Batangas. Nevertheless conditions are improving, as the more dangerous diseases are disappearing from Antique, Tarlac, Pampanga, Pangasinan, Isabela, and other provinces. Reports show that rinderpest has entirely disappeared from Himamaylan, Occidental Negros, and San Miguel, Ilocos Norte.

Rinderpest has made its appearance in Cavite and Bataan. The ravages have been the greatest in Orion, Bataan, owing to the inability of the officials to enforce the quarantine regulations.

Rinderpest has practically disappeared from the towns of Siquijor and Larena, Oriental Negros; anthrax has disappeared in Cuenca, Batangas, and surra in Bohol. There has been a marked improvement in the condition of cattle in Bacnotan and Aringay in Union Province, also in Maasin and Hilongos in Leyte, Calbiga in Samar, and Candelaria in Tayabas.

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM MONTHLY CROP REPORTS FOR THE MONTH OF MAY, 1909.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Agusan (reports from 3 towns):		<i>Hectares.</i>	<i>Hectares</i>		
Corn	Good	30	10	11,250	Liters.
Abaca	Fair		150	23,719	Kilos.
Coconuts	Good			10,000	Nuts.
Rice	Fair				
Albay (reports from 14 towns):					
Abaca	Good	218	6,533	1,101,246	Kilos.
Rice	do	579	200	164,250	Liters.
Coconuts	do			754,000	Nuts.
Corn	do	77	79	34,300	Liters.
Ambos Camarines (reports from 25 towns):					
Rice	do	479	1,493	1,282,800	Liters.
Abaca	do	152	3,319	795,495	Kilos.
Coconuts	Fair			1,052,000	Nuts.
Corn	do	278	76	14,100	Liters.
Antique (reports from 9 towns):					
Rice	Good	2,855			
Sugar cane	do		98	154,963	Kilos.
Corn	do	476	69	19,875	Liters.
Abaca	do	10	11	3,226	Kilos.
Bataan (reports from 7 towns):					
Rice	do	78	550	300,750	Liters.
Corn	Fair	1,348	5	8,550	Do.
Sugar cane	do				
Batangas (reports from 10 towns):					
Rice	Fair	8,720			
Sugar cane	Good	71	60	80,328	Kilos.
Corn	Fair	1,578			
Abaca	do		33	4,364	Kilos.
Benguet (reports from 12 towns):					
Rice	do	16			
Coffee	Good	2			
Corn	do	2			
Sugar cane	Fair			1,139	Kilos.
Bohol (reports from 24 towns):					
Rice	Good	425	1,606	762,750	Liters.
Corn	Fair	2,504	84	25,875	Do.
Coconuts	do			1,479,000	Nuts.
Abaca	do	2	433	59,835	Kilos.
Bulacan (reports from 13 towns):					
Rice	Excellent		867	4,454,400	Liters.
Sugar cane	Fair	25		15,813	Kilos.
Corn	Good	40			
Tobacco	Fair	25		23,460	Kilos.
Cagayan (reports from 12 towns):					
Rice	Good	174			
Corn	do	2,194	711	1,278,900	Liters.
Tobacco	Fair		2,520	951,740	Kilos.
Sugar cane	do	9			

Crops planted and harvested and condition of same taken from monthly crop reports for the month of May, 1900—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Capiz (reports from 21 towns):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Good	8,181			
Abaca	Fair	57	105	37,381	Kilos.
Tobacco	do	5	21	36,570	Do.
Corn	Good	687	4	1,125	Liters.
Cavite (reports from 7 towns):					
Rice	do	105			
Corn	Fair	54			
Sugar cane	Good				
Abaca	do				
Cebu (reports from 27 towns):					
Corn	Fair	17,058	569	342,525	Do.
Tobacco	do		3,634	671,600	Kilos.
Sugar cane	Good	131	94	370,835	Do.
Abaca	do	377	212	100,188	Do.
Ilocos Norte (reports from 10 towns):					
Corn	Fair	159	105	73,350	Liters.
Tobacco	Good	4	185	125,902	Kilos.
Maguay	do	15		696	Do.
Rice	Fair	58			
Ilocos Sur (reports from 21 towns):					
Corn	Good	1,204	509	140,775	Liters.
Tobacco	do		275	60,904	Kilos.
Sugar cane	do				
Maguay	Fair	26	700	190,572	Do.
Iloilo (reports from 15 towns):					
Tobacco	Good		320	58,328	Do.
Corn	do	2,910	113	59,700	Liters.
Sugar cane	do	73	40	20,240	Kilos.
Rice	do	3,660			
Isabela (reports from 5 towns):					
Tobacco			570	179,400	Do.
Corn	Fair	652		16,875	Liters.
La Laguna (reports from 17 towns):					
Coconuts	Good			3,415,000	Nuts.
Abaca	do	5	984	72,674	Kilos.
Rice	do	320	499	1,081,800	Liters.
Sugar cane	Fair	210	80	227,700	Kilos.
La Union (reports from 9 towns):					
Rice	Good	237			
Corn	do	346			
Tobacco	do		3,161	621,460	Do.
Maguay	do		15	4,744	Do.
Lepanto-Bontoc (reports from 15 towns):					
Rice	do	356	26	53,175	Liters.
Corn	Fair	204	9	1,275	Do.
Sugar cane	Good	14	2	6,325	Kilos.
Tobacco	do		67	26,266	Do.
Leyte (reports from 11 towns):					
Rice	do	30	3,627	3,481,875	Liters.
Abaca	do	191	1,592	536,613	Kilos.
Corn	do	572	513	604,125	Liters.
Coconuts	Fair			1,232,000	Nuts.
Mindoro (reports from 2 towns):					
Rice	Good	440			
Abaca	do		10	886	Kilos.
Coconuts	do			9,000	Nuts.
Corn	do	4			
Misamis (reports from 4 towns):					
Abaca	Poor	50	350	75,457	Kilos.
Coconuts	Fair			511,000	Nuts.
Corn	Poor	440	11	16,800	Liters.
Sugar cane	Good	10	10	25,300	Kilos.
Moro (reports from 5 towns):					
Rice	do	10	100	112,500	Liters.
Abaca	do		218	113,154	Kilos.
Coconuts	do			38,000	Nuts.
Corn	do	4			

Crops planted and harvested and condition of same taken from monthly crop reports for the month of May, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Nueva Ecija (reports from 15 towns):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	370	440	2, 025, 000	Liters.
Corn	do	480			
Sugar cane	Good	115	5	3, 163	Kilos.
Tobacco	Fair		49	16, 560	Do.
Nueva Vizcaya (reports from 3 towns):					
Rice	Good				
Sugar cane	do				
Tobacco	Poor				
Corn	Fair				
Occidental Negros (reports from 12 towns):					
Sugar cane	Good	810	2, 090	2, 555, 300	Kilos.
Corn	Fair	585	135	60, 750	Liters.
Coconuts	Good			307, 000	Nuts.
Abaca	do	23	66	42, 378	Kilos.
Oriental Negros (reports from 14 towns):					
Sugar cane	Fair	81	65	237, 188	Kilos.
Rice	Good	440	750	1, 125, 000	Liters.
Corn	Fair	4, 210			
Tobacco	do		302	207, 552	Kilos.
Pampanga (reports from 9 towns):					
Rice	Good	53	9, 746	4, 624, 875	Liters.
Sugar cane	do	6, 050	2, 916	1, 265, 000	Kilos.
Corn	do	3, 838	235	338, 250	Liters.
Pangasinan (reports from 31 towns):					
Rice	do	1, 483			
Corn	Fair	2, 553	420	421, 125	Liters.
Coconuts	Good			427, 000	Nuts.
Tobacco	do	30	536	619, 988	Kilos.
Rizal (reports from 14 towns):					
Rice	do	29	76	159, 000	Liters.
Corn	Fair	424		12, 600	Do.
Sugar cane	Good	215			
Abaca	Fair	2			
Samar (reports from 20 towns):					
Abaca	Good	145	542	219, 794	Kilos.
Corn	do	371	31	6, 975	Liters.
Rice	Fair	179	2, 380	1, 565, 700	Do.
Coconuts	do			422, 000	Nuts.
Sorsogon (reports from 18 towns):					
Rice	Fair	97	2, 863	1, 250, 025	Liters.
Abaca	do	94	4, 035	980, 628	Kilos.
Sugar cane	do	37	23	4, 068	Do.
Corn	do	252	25	8, 925	Liters.
Surigao (reports from 2 towns):					
Rice	do				
Abaca	Good	8	10	3, 163	Kilos.
Coconuts	do			5, 000	Nuts.
Tarlac (reports from 9 towns):					
Rice	Fair	803			
Sugar cane	do	85	102	265, 650	Kilos.
Tobacco	Good	14	15	690	Do.
Corn	Fair	165	20	1, 500	Liters.
Tayabas (reports from 16 towns):					
Coconuts	do			1, 572, 000	Nuts.
Rice	Good	1, 223	1, 509	1, 801, 275	Liters.
Tobacco	do		50	14, 766	Kilos.
Abaca	Fair	8	289	55, 407	Do.
Zambales (reports from 8 towns):					
Rice	Good	163			
Coconuts	do			8, 000	Nuts.
Corn	do	16	66	99, 075	Liters.
Maguay	do		5	380	Kilos.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the month of May, 1909.

[NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal.]

Province.	Unhulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	3.00	2.00	8.00	5.06	7.00	7.00	6.00	6.00	12.00	12.00	2.00	2.00
Albay	3.25	1.50	8.50	5.00	7.50	6.00	5.00	5.00	12.00	12.00	5.00	1.50
Ambos Camarines	3.50	2.00	9.00	4.00	7.00	5.00	5.00	5.00	12.00	12.00	4.00	1.00
Antique	3.12	1.75	22.00	12.00	6.50	6.00	6.00	3.00	25.00	25.00	2.50	1.25
Bataan	2.75	1.25					6.00	4.00			4.00	2.00
Batangas	3.50	2.60	10.00	6.00			7.00	3.00	8.00	8.00	3.12	2.00
Benguet	8.00	5.00					6.00	3.00			5.00	4.00
Bohol	3.50	2.00	12.00	8.00	9.25	7.00	6.00	4.00	24.00	24.00	4.00	2.50
Bulacan	2.50	1.80					7.00	6.50	18.00	18.00	2.50	2.00
Cagayan	4.50	3.50					7.00	4.00	25.00	25.00	6.00	2.00
Capiz	3.25	1.75	16.00	7.00	7.20	5.00	7.00	5.00	40.00	40.00	2.30	1.20
Cavite	3.00	2.40	11.00	11.00			2.75	2.75				
Cebu	4.50	2.50	16.00	5.50			4.00	2.00	35.00	35.00	5.00	3.50
Ilocos Norte		5.00			9.00	8.00	8.00	2.50	18.00	18.00	3.00	1.00
Ilocos Sur		5.00			5.00	2.50	8.00	2.00	18.00	18.00	3.00	1.00
Iloilo		5.00	18.00	12.00	10.00	10.00	7.00	2.00	25.00	25.00	4.00	2.50
La Laguna	3.50	2.50			9.00	6.00	5.50	3.60	18.00	18.00	4.00	2.50
La Union	5.00	3.50	16.00	5.00	7.00	4.75	5.80	3.60			5.00	2.50
Lepanto-Bontoc		5.00			6.00	6.00	5.00	4.50	9.00	9.00	2.25	4.00
Leyte	6.00	3.50					4.00	3.50	20.00	20.00	4.00	5.00
Manila		5.00	11.00	6.00	8.00	3.50	7.50	4.50	20.00	20.00	4.00	2.00
Mindoro		5.00	12.00	6.00	8.00	6.75	4.00	4.00	20.00	20.00	6.00	2.00
Misamis	3.50	3.00	11.00	6.00	7.50	7.00	7.50	2.50	20.00	20.00	2.50	2.50
Moro	3.00	2.25	11.00	8.00			5.00	5.00	20.00	20.00	2.50	2.00
Nueva Ecija	3.60	1.25					4.00	5.00	35.00	35.00	4.50	2.00
Nueva Vizcaya	2.00	1.50					5.50	5.50	25.00	25.00	6.00	3.50
Negros Occidental	3.12	2.50	11.00	8.00	9.00	5.00	3.75	3.75	35.00	35.00	6.50	2.50
Negros Oriental	5.00	3.50	14.00	6.00	9.00	6.50	4.00	4.00	25.00	25.00	2.00	2.00
Palawan	3.00	3.00					5.50	5.50	35.00	35.00	6.00	3.50
Pampanga	2.50	1.50					4.10	4.10	30.00	30.00	2.50	1.50
Pangasinan	5.50	1.70			7.00	2.50	6.40	3.20	6.00	6.00	5.00	1.50
Rizal	3.00	2.50					7.00	5.00	10.00	10.00	2.50	2.50
Samar	4.50	2.00	12.00	6.00	7.50	5.50	5.00	5.00	25.00	25.00	2.00	1.50
Sorsogon	3.75	2.50	13.75	5.00	7.00	2.50	6.75	3.00	3.50	3.50	2.50	1.50
Surigao	2.50	1.50	10.00	8.10	6.50	6.00	6.00	3.00	7.00	7.00	2.60	1.25
Tarlac	4.50	1.50			4.50	4.50	6.00	6.00	10.00	10.00	3.00	2.50
Tayabas	5.00	2.00	12.00	3.00	6.20	4.00	6.00	4.00			6.00	1.50
Zambales	4.50	1.50			5.00	5.00	6.00	4.00				

PERIODICALS IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

Everyone interested in the study of tropical agriculture is invited to visit the library and make use of these periodicals.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
Journal of the College of Agriculture, Tokyo, Japan.
Hawaiian Forester and Agriculturist, Honolulu, Territory of Hawaii.
Tropical Agriculturist, Colombo, Ceylon.
Memoirs of the Department of Agriculture, Calcutta, India.
Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
Bulletin of the Department of Agriculture, Kingston, Jamaica.
Journal of the Jamaica Agricultural Society, Kingston.
Journal of the Board of Agriculture of British Guiana, Georgetown.
California Cultivator, Los Angeles, California.
The Rural Californian, Los Angeles, California.
Farmer and Fruit Grower, Jacksonville, Florida.
Louisiana Planter, New Orleans, Louisiana.
Southern Cultivator, Atlanta, Georgia.
Progressive Farmer, Raleigh, North Carolina.
Farmer's Guide, Huntington, Indiana.
Kansas Farmer, Topeka, Kansas.
Farm Press, Chicago, Illinois.
The American Florist, Chicago and New York.
The Feather, Washington, D. C.
The American Thresherman, Madison, Wisconsin.
Oregon Agriculturist, Portland, Oregon.
The Gardener's Chronicle, London.
Commercial America, Philadelphia, Pennsylvania.
Tropical Life, London, England.
Horn and Hoof, Seattle, Washington.
The Breeders' Gazette, Chicago, Illinois.
The Journal of Tropical Veterinary Science, Calcutta, India.
American Veterinary Review, New York.

REPORTS AND QUOTATIONS.

Crop Reporter, by the Secretary of Agriculture, Washington, D. C.
 Monthly Consular and Trade Reports, Washington, D. C.
 Federal Reporter, New York, N. Y.
 Smith and Schipper's Monthly Report, New York, N. Y.
 Hanson and Orth, Hemp Brokers, Monthly Statement, New York.
 Hemp Market Report, Landauer & Co., London.
 Ide and Christie's Monthly Circular, London.
 Exporters and Importers Journal, Chicago, Illinois.
 Quarterly Summary of Commerce of the Philippine Islands, Washington, D. C.
 Ker & Co's. Price Current, Manila, Iloilo, and Cebu, P. I.
 Weekly Shipping Circular (Sugar), Jose T. Figueras, Iloilo, P. I.

LOCAL.

Official Gazette, Manila, P. I.
 Far Eastern Review, Manila, P. I.
 Philippine Journal of Science, Manila, P. I.
 Weather Bureau Bulletins, Manila, P. I.
 The Philippine Agricultural Review, Manila, P. I.

SPANISH.

Boletin de la Cámara de Comercio Filipina, Manila, P. I.
 Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Habana, Cuba.
 Boletin de Agricultura, San José, Costa Rica.
 Hacendado Mexicano, El, Mexico, Mexico.
 Hacienda, La, Buffalo, New York.
 Industrias Americanas, New York, N. Y.
 Agricultor Peruano, El, Lima, Peru.
 Prácticas Modernas é Industrias Rurales, La Coruña, Spain.
 Resumen de Agricultura, Barcelona, Spain.

OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
 Bulletin Economique, Hanoi-Haiphong, Indo-China.
 Bulletin du Département de l'Agriculture aux Indes Néerlandaises, Buitenzorg, Java.
 L'Agronomie Tropicale, Brussels, Belgium.
 Boletim de Agricultura, Sao Paulo, Brazil.
 Tamil Journal of South India Agriculture, Madras, India.
 Station Agronomique, Port Louis, Colony of Mauritius.
 Journal d'Agriculture Tropicale, Paris.
 Boletim do Museu Goeldi, Para, Brazil.

THE PUBLICATIONS OF THE BUREAU OF AGRICULTURE.

The following-named bulletins of the Bureau of Agriculture are available for distribution, and will be sent free of charge to any address upon application. Applicants are requested to state whether all publications of the Bureau are desired as issued, or only those specified. The name and address of the applicant should be plainly written and all communications should be addressed to the Director of Agriculture, Manila, Philippine Islands.

FARMERS' BULLETINS.

- No. 4. Preliminary Report on Commercial Fibers of the Philippines. (Spanish.)
- No. 6. Experimental Work with Fungous Diseases of Grasshoppers. (Spanish.)
- No. 9. A few Suggestions on the Cultivation of Cotton. (Spanish.)
- No. 11. The Jute Industry. (Spanish.)
- No. 12. Abacá. (Manila Hemp.) (English.)
- No. 13. The Cultivation of Maguey in the Philippine Islands. (English and Spanish.)
- No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
- No. 15. Tobacco Growing in the Philippines. (English and Spanish.)

PRESS BULLETINS.

- No. 6. The Tamarind. (English.)
- No. 8. Maguey; Propagating Abacá from Seed; etc. (English.)
- No. 9. Agricultural Districts; Control of Rinderpest; etc. (English.)
- No. 11. Seed Distribution; Need of Diversified Farming; etc. (English and Spanish.)

POPULAR BULLETINS.

- No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
- No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)

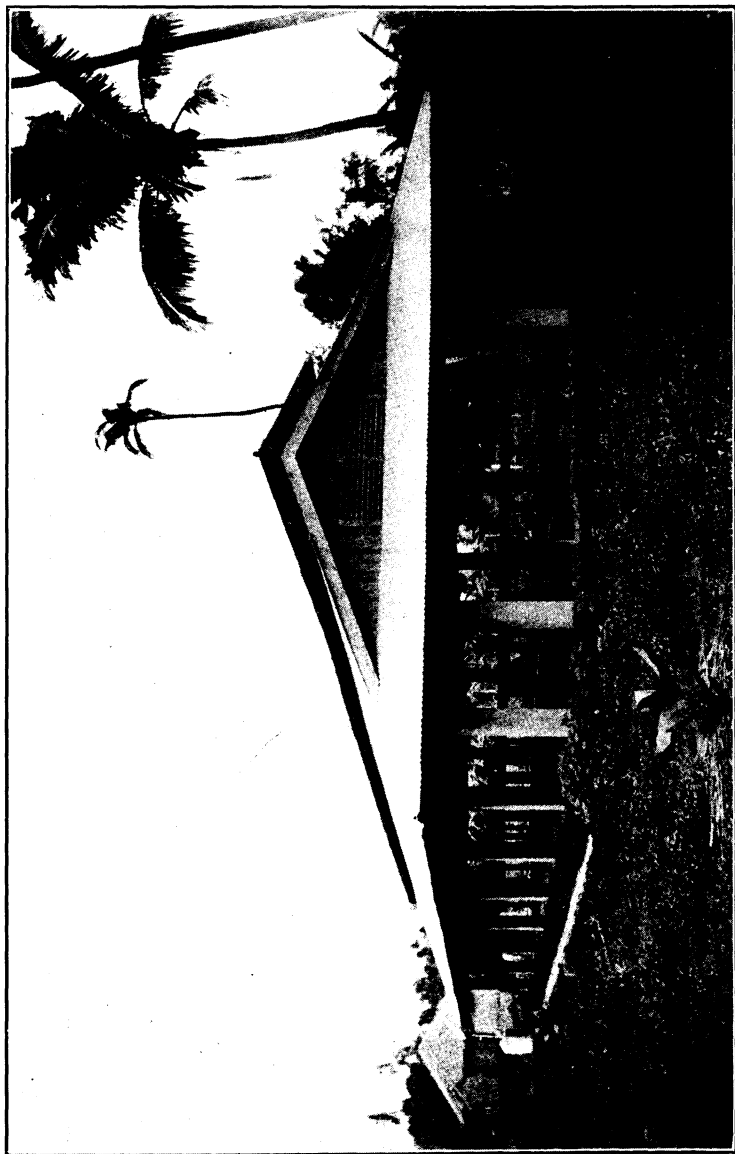


PLATE I.—GENERAL QUARANTINE DEPOT, ILOILO LIVE-STOCK QUARANTINE STATION.

THE PHILIPPINE *Agricultural Review*

Vol. II

SEPTEMBER, 1909

No. 9

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	486
School Gardens in Ceylon, by C. Driberg, Superintendent of School Gardens.....	492
Iloilo Live-Stock Quarantine Station, by J. E. Nance, D. V. M., Bureau of Agriculture	494
The Culture of Ylang-ylang.....	496
The Law Providing for a Sugar-testing Laboratory in Iloilo.....	500
Pineapple Growing in Bataan and Bulacan Provinces, by Mariano M. Cruz, Agricultural Assistant	502
Conservation of the Natural Resources of the Philippine Islands, by Geo. P. Ahern, Director of Forestry.....	508
Agriculture in Japan, by Frank G. Carpenter.....	513
Estimated Cost of a Coconut Plantation in the Federated Malay States.....	519
Current Notes: The New Tariff Law; Government Guaranty of Philippine Tobacco; Ambalangan-Dalin Irrigation Project; Hemp-stripping Machines; Telephone and Telegraph Service for the Island of Panay; The Siasi Plantation and Trading Company; Irrigation Work in Bulacan; Java Exhibits for the Carnival; Provincial Fairs and Expositions; Circle for the Study of the Social and Economic Conditions in the Philippines; Village and Rural Improvement Societies; Manila Cigars for the United States; Additional Veterinarians for the Bureau of Agriculture	521
Notes from Other Fields: Pineapple Growing in the Far East; Rice Raising in Formosa; Dyestuffs from Mangrove Trees; The Sumatra Tobacco Crop; United States Tobacco in China; A Reward for the Extermination of White Ants; Para District Rubber Exports; A Market for Matting; Mr. Root and the People of the United States; The National Wealth of the United States; The National Corn Exposition; The National Irrigation Congress; The Tobacco Crop in the United States; Tuskegee Industrial Institute; Philippine Cigars in the American Market.....	526
Principal Philippine Imports and Exports for July.....	531
Agricultural Conditions for June.....	532
Temperature and Rainfall in Agricultural Districts for July.....	535
Crop Reports for June.....	536
Range of Prices of Philippine Agricultural Products for June.....	539
The Library of the Bureau of Agriculture.....	540

ILLUSTRATIONS.

PLATE I. General Quarantine Depot, Iloilo Live-stock Quarantine Station.....	Frontispiece.
	Facing page—
II. Hospital for Diseased Animals, Iloilo Live-stock Quarantine Station.....	494
III. (a) Pineapple Fruit Grown at Singalong; (b) Pineapples Growing Without Shade at Lamao.....	504

EDITORIAL.

TEMPERATURE AND RAINFALL IN AGRICULTURAL DISTRICTS.

In this number of the REVIEW, following the article contributed by the Weather Bureau, "How a Knowledge of the Weather Benefits the Farmer," we are presenting the data giving the temperature and rainfall for each day of the month of July in the principal agricultural districts of the Islands.

As stated in the article above mentioned, it is clear to everyone that the weather has a very important bearing on agriculture and that a knowledge of it is useful to the farmers. The value of such information is, in a measure, demonstrated by the fact that particular sections of the Islands are more successful in raising certain staple crops than others. The great hemp-producing belt of the Philippines corresponds more or less closely to the heavy-rain belt extending along the east coast of the Archipelago; sugar growing is carried on more successfully, or more largely at least, on the Islands of Negros and Panay and in the Pampanga and Agno River Valleys; the production of the best tobacco is confined more or less closely to the Cagayan River Valley and the Province of Union; the coconut industry seems to flourish best on the sandy land along the coasts where there is abundant wind and rain, although it is important that the trees be sheltered from heavy storms, such as baguios or typhoons. The reason for this localization of different kinds of farming is doubtless largely due to the climatic and weather conditions which prevail in the different sections. The question for each individual farmer then is, What are the crops which are adapted to the climatic conditions—temperature and rainfall—that prevail on my farm?

Only as the farmers of the country make a careful study of the climatic conditions under which the different economic or agricultural plants prosper is it possible for them to determine the most favorable conditions for growing the different crops and for securing the best and largest yields. As already indicated it is seen that certain plants do best only where there is a heavy rainfall, while others require only a medium rainfall, and some do well in comparatively dry or arid sections.

With the idea of encouraging and assisting the farmers of the Philippines in the study of the climatic conditions under which their crops must be raised, the REVIEW, with the coöperation of the Weather Bureau, will publish from month to month the data showing the temperature and rainfall for the principal agricultural sections of the country. In this way they may determine in a large measure what crops are best adapted to the climatic conditions of their respective sections and abandon efforts along agricultural lines which can never be a success because of the climatic conditions, as exemplified in the case of the rice-raising experiments of the farmers on the Island of Cebu.

PINEAPPLE GROWING IN THE PHILIPPINES.

In this number of the REVIEW we are presenting an article on pineapple growing in Bataan and Bulacan Provinces by Mr. Mariano M. Cruz, an agricultural assistant of this Bureau. Mr. Cruz has very carefully summarized the status of this industry in the Philippines, which is centralized in the provinces above mentioned.

Attention is called to the careful discussion of this industry under the headings "fiber" and "fruits," leading pineapple districts under which are given the names of some of the principal planters, varieties of fruit raised, methods of cultivation, seasons for planting and harvesting, estimated expense and income from a small plantation, some very pertinent suggestions regarding the selection of plants, proper cultivation and the use of fertilizers, and a comparative survey of pineapple production in other countries.

In this connection attention is invited to "Pineapple Growing in the Far East," under Notes from other Fields, in which it is seen that the output of a single factory in Hozan, Formosa, was 220,000 cans in 1906, 330,000 cans in 1907, and 350,000 cans in 1908. This factory also extracts the fiber from the leaf and uses it in the manufacture of grass cloth. In the Hawaiian Islands the pineapple industry has rapidly developed in the last few years so that Honolulu is said to have the largest pineapple cannery in the world, and the output for this year is estimated at 350,000 cases. The Straits Settlements, which probably has the largest pineapple industry in the world, shipped from Singapore, in 1907, 845,900 cases, valued at ₱3,576,000. The declared exports of these goods to the United States amounted to ₱370,112 in 1906 and ₱1,197,440 in 1907. With such a pineapple industry being developed on every hand there seems to be little reason why capitalists should not invest in such an enterprise in these Islands, which should be as profitable here as in the Straits Settlements, Formosa, or Hawaii.

CONSERVATION OF THE NATURAL RESOURCES OF THE PHILIPPINE ISLANDS.

In connection with the editorial and article in the December number of the REVIEW by the Director of Agriculture, we are glad to present in this number of the REVIEW another article on national conservation, prepared under the direction of Maj. George P. Ahern, Director of Forestry.

It would seem that this subject is, indeed, a very pertinent one for the Insular Government, more especially since we are doing work for another people, who, in the course of time, hope to take over the control of their own affairs. At this time we are reminded of President Taft's declaration, when Governor of the Islands, that one of the fundamental

features of the policy of this Government is "the Philippines for the Filipinos." In this connection also we have the words of Mr. Root before Congress: That the American people are pledged to lead the people of the Philippine Islands on by paths of growing prosperity and capacity for government to the point where they will be capable of supporting and governing themselves. Mr. Root states that it is the bounden duty of the people of the United States to give the people of the Philippines opportunities to grow in habits of industry, in the building up of national pride and national power, and to grow in the accumulation of property and the diffusion of wealth which lies at the foundation of civilization. If these are to be the guiding principles of our work here it would seem that a policy of conservation is emphatically the duty of the Insular Government toward the Filipino people.

In this article Mr. Sterrett gives the origin of the conservation idea in the United States and outlines the opportunities for conservation by the Insular Government. The importance of conservation was repeatedly emphasized by President Roosevelt, and the matter has received enthusiastic indorsement and is being pushed by the people of Hawaii.

Under the opportunities for conservation in the Philippines, it is pointed out that all but a small percentage of the land is held by the Government. It would seem to be clearly the duty of all departments of the Government to provide against and to prohibit the spoliation of the natural resources of these Islands. Forest reserves should be set aside and carefully protected; necessary watersheds should be carefully looked after not only in the interest of the present development of agriculture but for the future progress of the Islands.

Attention is called to the importance of the adoption of a definite conservation policy by the Government in handling the natural resources of the Islands with reference to the welfare of future generations as well as for the best development of these resources at the present time.

The effect of such a policy consciously adopted by the different Bureaus of the Insular Government, as a basic principle influencing their work, would be of inestimable value. Such a policy would serve to unify and correlate the work of all the Bureaus and give the work of each Bureau added significance. It should bring about hearty coöperation in the work of the various Bureaus, which is essential to the proper handling of the natural resources of the Islands. In this age it is conceded by the most progressive governments that the development of natural resources without reference to future production is an uncalled-for waste, and that the most intelligent development of agricultural or forest resources will not only secure the best returns for present generations but will result in even larger returns for future generations.

AGRICULTURE IN JAPAN.

The leading article in this number of the REVIEW is by Mr. Frank G. Carpenter, a writer of national reputation, on "Agriculture in Japan." Doubtless not a few of our readers are admirers of the progress made by the Japanese people. In this connection attention is invited to the activity of the people, the great resources of the Japanese Empire, and more especially the agricultural productions of the country. No one who has visited Japan can fail to admire the cleanliness, good cheer, thrift, enterprise, and energy of the Japanese people. Mr. Carpenter, after spending two months in different parts of the country, gives the following summary of its agricultural productions: 1,000,000 bushels of rye, barley, and wheat; 250,000,000 bushels of rice; 1,000,000 pounds of tobacco; 56,000,000 pounds of silk cocoons, beside the production of buckwheat, millet, beans, indigo, cotton, and hemp. The rice crop alone is estimated at ¥400,000,000 annually. Stock farming is an important feature of agriculture in the Empire; Japan reports 1,000,000 cattle and 1,000,000 horses.

One of the most remarkable features of agriculture in Japan is the close or intensive cultivation practiced by Japanese farmers. Nothing is too small for their attention. The smallest details in the selection, planting, cultivation, and harvesting of various crops receive the attention of the Japanese agriculturists. Often their fields are no larger than bed covers, but every part of them receives the most thoughtful care. Whole families make their living from the cultivation of a hectare of land. What better lesson could there be for the average farmer of the Philippines, who pays little or no attention to the selection of seed, to the methods of planting, cultivation, and harvesting for securing a large yield of the best quality from each crop.

The Japanese farmer, on the contrary, studies to inform himself regarding the selection of seed, the best methods of planting, the best methods of cultivation, and the best manner of harvesting, and is always in the field himself seeing to it that these methods are actually put into practice. Japan, including Formosa, has an area of 161,160 square miles. Of this area only about one-fourth or little over 20,000 square miles, is cultivated, but this cultivated area, while less than one-sixth of the area of the Philippine Islands (127,853 square miles), feeds a population of more than 50,000,000 people, more than one-half of the population of the United States.

We have often called attention to the importance of the rice-raising industry in the Philippine Islands. Mr. Carpenter states that Japan is rich or poor according as the rice crop does well or ill. In time past the royal taxes were paid in rice, and to-day the financiers watch the growth of this crop as the people of the United States watch the growth

of the corn, cotton, and wheat crops. In Japan the ground for the rice crop is prepared during the winter, it is covered with manure, and made level as a floor. In April it is broken up again with hoes or spades and then flooded. It is not too small a thing for the people of Japan to give their attention to individual plants; when one sees a rice plant out of position or not deep enough in the water he will at once reach down and fix it; in this way every rice stalk is made to yield its largest and best product. The Japanese are lovers of nature; a plant fallen down or a tree whose branches are burdened with flowers or fruit receives their immediate attention.

Another important matter for Filipino farmers to note in connection with agriculture in Japan is the wages paid to farm laborers. The average wage paid to a farm hand in Japan is 32 centavos a day for men and 20 centavos a day for women. Men are paid, including board, ₱116 a year, or less than ₱10 a month, and women get about ₱100 a year, or less than ₱8 a month. With all of their wonderful energy and thrift the masses of the people in Japan live on a simple diet of fish, rice, and vegetables the same as the Filipinos. Filipino farm laborers would scorn such a wage as the Japanese receive, and notwithstanding much larger wages are offered in the Philippines there seems to be little or no inclination to work on the part of the masses of the people who have to work for a living, and little or no ambition to make their country productive like Japan—to put it on an independent financial and commercial basis. It is not to be wondered at that Japanese farm laborers are emigrating to Korea and Manchuria.

One of the most interesting features which is immediately noted in connection with agricultural progress in Japan is the amount of money voted by the Imperial Government to educate the people, and to assist them in every way, by establishing elementary agricultural schools, agricultural experiment stations, and agricultural colleges. The fact that Japan has an imperial cattle and horse breeding establishment, a horse administration bureau, two large agricultural colleges, one at Tokyo and one at Sapporo, 36 smaller agricultural colleges, special schools for silk culture and tea raising, 200 agricultural experiment stations, and 300 traveling agricultural lectures should be noted by everyone interested in the agricultural development of the Philippines. When the people of the Philippines begin to show an appreciation of the agricultural resources of their country and the Philippine Legislature makes provision for such lines of work it will be possible for the Philippine Bureau of Agriculture to accomplish results comparable with the progress made by the agriculturists of Japan.

Another fact noted by Mr. Carpenter during his study of the work of the agriculturists of Japan is an example of their wonderful energy and industry, namely, their home industries, which are carried on during

the winter months. The farmers, who are busy in the field during the spring, summer, and early autumn, are in the winter months busily engaged in their homes making starch, macaroni, sweets, mats, straw braid, baskets, bags, ropes, raincoats, and straw hats which are used by themselves during the summer season or sold and sent to other parts of the Empire.

Only about one-half of the agriculturists of Japan own their farms, the remainder are tenants or renters. The Imperial Government aims to assist not only the owners but the renters of agricultural lands and for this purpose it has established an agricultural bank, the Hypothec, with a capital ¥10,000,000, which loans out money to farmers' associations and individual farmers upon real estate security. It also gives long time loans payable by installments at a low rate of interest; it issues savings bonds in denominations as low as ¥5 for the encouragement of thrift.

In conclusion, we invite the attention of Filipino farmers to the following statement from the "Annual Return of the Foreign Trade of the Empire of Japan for 1908" as compared with the exports and imports of the Philippine Islands. The imports from the United States in 1888 amounted to 5,500,000 yen, in 1898 to 42,000,000 yen, and in 1908 to 78,000,000 yen. The exports from Japan to the United States amounted in 1888 to 63,000,000 yen, in 1898 to 163,000,000 yen, and in 1908 to 122,000,000 yen. While the exports and imports of the Philippine Islands may not be altogether a correct index of the energy, industry, and progress of the Filipino people, they stand in striking contrast with the exports and imports of the Japanese Empire, which are a good index of the energy, industry, and progress of the people of Japan.¹

¹ For Japan in 1908 the imports were 435,000,000 yen and the exports 378,888,000 yen. For the Philippine Islands in 1908 the imports were ¥58,372,240 and the exports ¥65,202,144.

SCHOOL GARDENS IN CEYLON.¹

By C. DRIEBERG, *Superintendent of School Gardens.*

PURPOSE, MANAGEMENT, AND JUDGING.

[Teachers' Leaflet No. 1 for 1909.]

The following circular, under the three heads (1) Object of school gardens; (2) Conditions under which they are worked; (3) Points in the judging of gardens, is sent for your information and guidance:

1. *Objects of school gardens.*—(a) To brighten the surroundings, of the school, and make it what it ought to be; viz, a pleasant resort for the boys and not a bare and unattractive building.

(b) To lighten the routine of class work by varying it with outdoor work of a recreative nature.

(c) To exemplify order, form, neatness, and good taste in the laying out of the premises.

(d) To furnish a field for nature study; i. e., the study of natural objects in their natural surroundings.

(e) To serve as object lessons in horticulture; i. e., the cultivation of useful and ornamental plants.

(f) To give a practical turn to school life, and provide a training in elementary agricultural science.

(g) To serve as centers for the dissemination of seeds and plants and of information concerning them.

(h) To be mediums of communication between the agencies that aim at the improvement of agriculture, and the cultivating classes.

(i) To induce the cultivator, directly or through the school boys, to take up new and improved products and adopt better methods of cultivation.

(j) To awaken in school children a new interest in the cultivation of plants, and instill in them a love of nature, and so reconcile them to a country life and to agricultural pursuits.

(k) To encourage school children to establish gardens at their homes.

(l) To make school boys take an honest pride in manual labor, and induce a healthy competition among them as well as between one school and another.

¹ From *The Tropical Agriculturist*, Vol. XXXIII, No. 1, July, 1909.

2. *Conditions under which school gardens are worked.*—(a) Any school which presents possibilities for school gardening will be furnished with a stock of implements and supplied with seeds from time to time; where required fencing wire will also be supplied.

(b) Garden work should be carried on by the teacher with the help of the monitors and scholars. After setting aside such part of the produce as is required for purposes of propagation the remainder should be divided among the head master, assistant masters, monitors, and boys who have actually assisted in the work of the garden.

(c) In the case of produce not actually used as food, and which it is desirable to dispose of with a view to profit, the amount realized is to be entered in the quarterly report form. The revenue from such cultivation will at the end of the year be equally divided, half to go to the head master and half to be devoted to a garden prize fund for the school.

(d) Quarterly reports should be furnished in the forms provided.

(e) The school gardens will be inspected periodically by the superintendent and his assistants, and prizes will be awarded by the department to teachers who show the best results.

(f) A certificate will accompany each prize, setting forth the nature of the award, etc., and certificates of honorable mention will also be awarded to deserving teachers.

3. *Points to be considered in the judging of school gardens.*—(a) Area cultivated.

(b) Situation and lay of land.

(c) Climate and rainfall.

(d) Number and variety of plants grown: (I) Economic; (II) ornamental.

(e) Laying out.

(f) Arrangement of plants and trees.

(g) Grouping for effect.

(h) Skill in cultivation.

(i) Cleanliness of premises.

(j) Cultivation in pots, tubs, and boxes.

(k) Bowers and arches.

(l) Fruit trees.

(m) Fences and hedges.

(n) Paths and drains.

(o) Lawn and playground.

(p) Furnishing of reports and returns.

(q) School-garden records.

(r) Activity and intelligence of scholars.

(s) Care of implements.

(t) Aptitude and interest shown by teacher.

ILOILO LIVE-STOCK QUARANTINE STATION.

By J. E. NANCE, D. V. M., *Bureau of Agriculture.*

The four buildings for the Iloilo live-stock quarantine station—namely, the general quarantine depot, the hospital for diseased animals, the matadero and storehouse, and superintendent's house, are now practically completed and ready to be used.

This station is located just outside of and across the Iloilo River from the city, on what is known as "La Granja Pequeña," which was in Spanish times an experiment station. The two cattle sheds and the storehouse and matadero are constructed of reënforced concrete, having iron roofs, open sides, and concrete floors with drainage canals. The dwelling for the superintendent is of native material.

Cattle shed No. 1, or the general quarantine building which will be used for animals not showing symptoms of disease, will accommodate from 80 to 100 animals. Cattle shed No. 2, the smaller structure, is for sick animals; it is fitted with stalls and feed boxes and will accommodate 40 cattle. The arrangement of stalls will be a decided convenience in administering medicines and taking of temperatures, whenever it is necessary to do so. The matadero, although not large, will be large enough for slaughtering as many cattle as will be necessary during a period of quarantine.

Included in the quarantine station site, are about 7 hectares of land inclosed by a five-wire fence with wood posts about $8\frac{1}{2}$ meters apart. Mexican June corn, Guinea grass, sorghum, and other forage plants have been put out and it is believed that sufficient forage can be grown here to supply the foreign animals while they are undergoing the required quarantine period, which is at least ten days from the time of embarkation.

The importation of cattle and carabaos into Iloilo has been steadily increasing for several years. The following statement will show the number of animals received at this port and the disposition made of them during the past fiscal year.

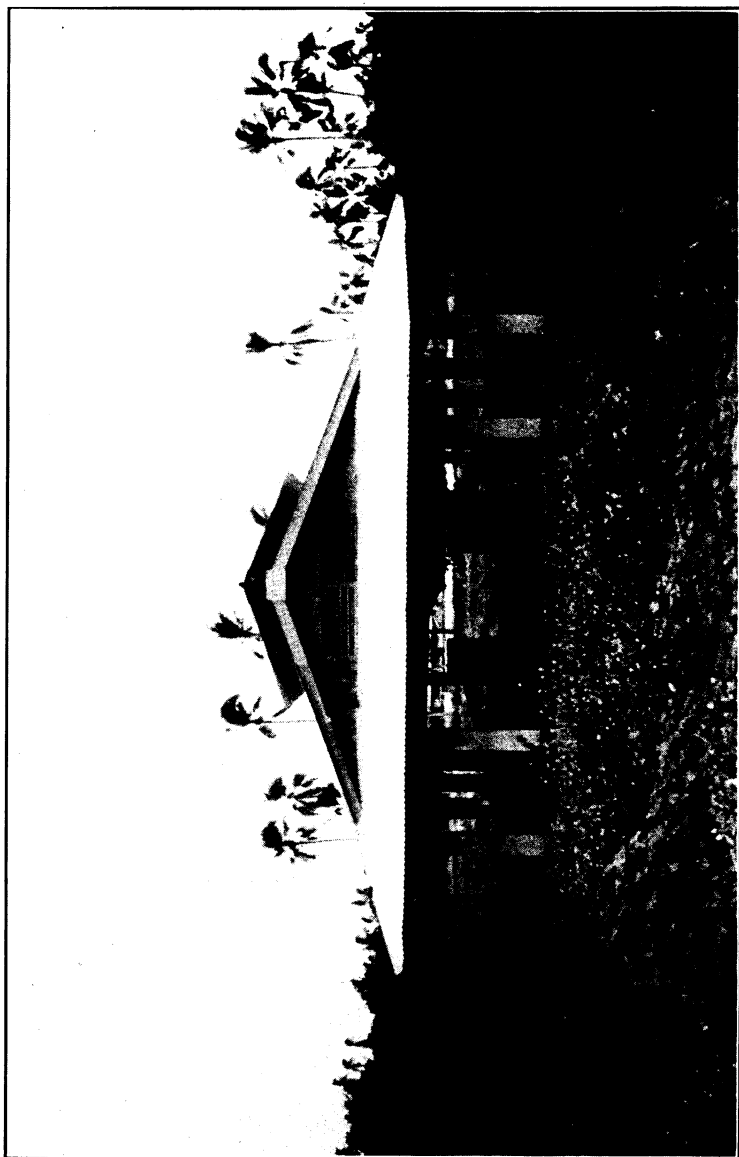


PLATE II.—HOSPITAL FOR DISEASED ANIMALS, ILOILO LIVE-STOCK QUARANTINE STATION.

Iloilo live-stock report for fiscal year ending June 30, 1909.

Kind.	Received from—			Disposition.					
	Philippine Island ports.	Foreign ports.	Total.	Removed.			Slaughtered.		
				Native.	Im-ported.	Total.	Native.	Im-ported.	Total.
Cattle.....	1,507	509	2,016	361	117	478	1,130	325	1,455
Carabaos.....	1,524	585	2,109	1,626	461	2,087	20	—	20
Horses.....	434	—	434	142	—	142	—	—	—
Hogs.....	3,855	—	3,855	29	—	29	8,155	—	8,155
Sheep.....	562	—	562	42	—	42	590	—	590
Goats.....	336	—	336	67	—	67	550	—	550

Infected or diseased animals.

	Diseased on arrival.		Developed disease after arrival.		Infected after arrival.		Total diseased.	Deaths from disease.	
	Native.	Im-ported.	Native.	Im-ported.	Native.	Im-ported.		Native.	Im-ported.
Cattle.....	—	118	2	21	118	—	259	27	5
Carabaos.....	—	39	9	12	49	30	139	33	30

It is expected that the present fiscal year will see double the number of cattle handled as compared with the year just closed.

At times, in their eagerness to purchase carabaos, the *hacenderos* have not always been careful enough in selecting them, and some unscrupulous dealers have sold animals which were diseased or had been exposed to some disease, thus exposing all the animals on the place to which they were taken. This danger will now be obviated, as no sick animal will be allowed to leave the station.

The greater part of the imported animals come here from French Indo-China and from British North Borneo. As they are on board from six to eight days, en route, the quarantine period on land is short, providing no symptom of disease develops, and as the care and keeping of the animals will be done at actual cost the importer will have much less bother, besides having a clean, comfortable, sanitary place to keep his stock.

It is the opinion of men competent to judge on such matters that the establishment of this quarantine station will do much to protect the animals already here and safeguard the health of those that come in the future.

THE CULTURE OF YLANG-YLANG.¹

DEVELOPMENT IN RÉUNION AND COCHIN CHINA.

Our readers may have noted in the last statistical tables of our valued collaborator, Mr. G. Ernst, that Réunion has now won recognition among the Ylang-ylang-producing countries. The distillers of Manila and Java will have henceforth to reckon with this new source of supply, for it is now an established fact that this tree prospers remarkably in the lowlands of Réunion and furnishes, in economic quantities, an essence equal to the best quality obtained in the Philippines.

MARKET CONDITIONS.

In order to reply in the most adequate manner to the inquiries that have been addressed to us regarding the present market conditions of the essence of ylang-ylang, we have sought information from the most competent industrial and commercial experts. First, Mr. Roure-Bertrand Fils, the able manager of the important firm at Grasse, France, gives, in a letter dated May 14, 1908, the following opinion:

Considerable quantities are beginning to arrive in the different markets from Réunion. We have had occasion to examine samples to the value of 450 or 500 francs, and in our opinion this essence is at least equal, if not superior, to that furnished by the Philippines, to which it bids fair to become a formidable rival. The shipments being made by post, it is very difficult to ascertain the figures regarding the importation into Europe.

With equal courtesy, Messrs. Schimmel & Co., of Miltitz, France, to whom we frequently apply for reliable information, have communicated with us as follows:

It is certain that the ylang-ylang met with in commerce is distilled principally in the Philippines² and in Java, and other countries are scarcely heard of in this connection. The present value of the very finest quality is about 5,000 francs per kilogram, while the medium quality scarcely exceeds 300 francs. The present production largely suffices for the demand, more especially since many perfumers and soap manufacturers prefer our synthetic essence of ylang-ylang, which is finer and more marketable.³

¹ Translated from *Journal D'Agriculture Tropicale*, June, 1908.

² The value of the exports of this product were \$15,930 in 1900, \$46,296 in 1901, \$63,270 in 1902, and \$123,182 in 1903.

³ This artificial product has already been discussed in No. 17 of the *Journal d'Agriculture Tropicale*, where it was seen that its influence on the market price of the natural product has not been very great.

In a more recent letter (May 30, 1908), Messrs. Schimmel call our attention to a passage in the Diplomatic and Consular Reports (No. 3973, April, 1908), which we here reproduce:

Two hundred liters of essence have been sold by Réunion dealers at an average price of 500 francs per liter. Many new plantations of ylang-ylang have been set out, and it is estimated that in three or four years the production will increase to 400 or 500 liters per year. The planters undoubtedly realize a very good profit at present, but it is to be feared that, as in the case of vanilla, an overproduction will lead to a fall in price.

PRODUCTION OF DIFFERENT COUNTRIES.

We find in the Bulletin Commercial of Réunion that the total exportation of essence amounts at the present time to only 279 kilograms. The importance and the value of the ylang-ylang cultivation in Réunion being thus established, we shall discuss what has been undertaken in other places.

In Jamaica there was an attempt, without very conclusive results, to distill the flowers of the trees which were cultivated in Hope Gardens. The details of this experiment, which does not seem to have been repeated since then, may be found in No. 52 of the Journal d'Agriculture Tropicale, 1905.

In Indo-China ylang-ylang is widely cultivated as an ornamental tree, but up to the present it does not seem to have been exploited for its perfume. Some cultural enterprises in Cochin China have been noted in a United States consular report (April, 1908), in which we read:

The plantation of ylang-ylang lies in the Province of Bienhoa, where the first results are encouraging. The present high price of the essence renders this culture very remunerative. It is estimated by the planters that a hectare planted with 600 trees will produce 6,500 kilos of flowers, which when distilled will furnish at least 16 kilos of essence.¹

In India attention has been drawn to ylang-ylang by the exhibition, at Kuaal Kangsar, of a sample of essence from the estate of Pula Daat, in Labuan. It was after a long sojourn in the Philippines that the director of Pula Daat undertook the extensive cultivation of this plant. He hopes this year to distill a considerable quantity for market. (Supplement to the Tropical Agriculturist, September, 1907.)

We have thus found that ylang-ylang is cultivated under excellent economic conditions in Réunion, and that the area planted to it is extending rapidly there as well as in Cochin China and English India.

THE CULTIVATION.

Useful information regarding the culture of this plant will be found in No. 17 of the Journal d'Agriculture Tropicale, and more recent documents enable us to add to this, now that the subject is again attracting attention.

¹ Mr. Martin de Flacourt estimates that in Réunion 1 hectare planted in ylang-ylang will yield about 4 kilograms of essence. (N. d. l. R.)

Botany.—The botanical species which furnishes the essence of ylang-ylang is *Cananga odorata* Hook F. and Thoms, more or less widely distributed throughout southern Asia. It appears that it is incorrect to distinguish, as is often done, between this species and *Unona odorata* Dun., which is identical with it. *Unona odorotissima* Steud, on the other hand, is the same as *Artabotrys odoratissimus* R. Br., a species that differs absolutely from *Cananga*, both in its general characteristics and the inferiority of its product. - It is important in cultivation to plant *Cananga odorata*, which is easily distinguished from *Artabotrys* by its distichous arrangement and more herbaceous appearance, recalling by these characteristics "anone cœur-de-boeuf" (*Anona reticulata*), and finally by its large flowers which grow only in groups of two or three.

In the specimens of this plant at the museum, examined by the late L. Pierre, a botanist whose work the Journal d'Agriculture has published, the identification is absolute between *Cananga odorata* and *Unona odorata*. If there exists a difference in the value of the essence produced, as Mr. Guerlain, the great Parisian perfumer, has indicated to us, it can only be attributed to physiological differences.

The culture of *Cananga odorata* in Réunion has been described explicitly by Mr. Martin de Flacourt in an article published by the Journal Officiel de Madagascar, March 19, 1904. According to this author the tree had been grown in Madagascar a long time, when a planter of Saint-Paul decided to submit some flowers for distillation, and the excellent quality of the essence was revealed. This was the beginning of methodical cultivation.

Climate.—Ylang-ylang requires a warm and even climate, soil that is rich, permeable, and healthy, and in Réunion it will not flower at an altitude of more than 400 meters.

Methods of reproduction.—The plant multiplies by means of seeds, which may either be planted directly in place, or in well-drained seed boxes and later transplanted. The seeds are taken from the fruit when it is perfectly ripe, and washed to free them from the sugary pulp which would attract ants and result in irregularities in germination. The plants sprout in from forty to sixty days, being sprinkled twice a day. After the plants are a month old they are transplanted into a shaded nursery and spaced at 20 centimeters, or, as is preferable, placed separately in cornucopias made of the leaves of *Pandanus utilis* to serve as flowerpots, or in bamboo pots which are protected by shelters made of palm leaves. The sprinklings are continued as before, and in two months the young trees are 25 or 30 centimeters high, and worth 40 francs per thousand, pots included.

Planting.—The permanent planting is made on clean ground, the trees are placed 4 or 5 meters apart, in holes 50 centimeters in diameter three-quarters filled with vegetable mold or manure and good earth. By fol-

lowing this scheme of planting five or six hundred trees can be planted to a hectare.

During the first years, it will be found necessary to keep the soil clean between the trees. The crops that can be raised in this way will more than pay for the trouble. In order to encourage the growth of the lateral branches, and by this means produce flowers that are more accessible, the trees are topped at a height of $2\frac{1}{2}$ or 3 meters.

In the third year there may be a crop of flowers that will bring 150 or 200 francs per hectare. This return will increase rapidly, and the period of full bearing will last eight or ten years.

GATHERING THE FLOWERS.

In Réunion, the harvest lasts from May to September. The work is done by women and children, who are careful to detach only full-blown flowers, and those of a clear yellow color. At the height of the flowering season the trees are gone over every two or three days, and the process of distillation can go on almost without interruption. Fresh flowers give the best essence.

Under these conditions, says M. Martin de Flacourt, 1 hectare regularly planted should furnish 3 or 4 kilograms of essence per year, estimating that from 50 to 64 kilograms of fresh flowers will yield 1 kilogram of essence. The cost of distilling varies with the country, depending upon the equipment in use, the price of labor, and the cost of fuel. The price, fixed at 22 to 30 francs per kilogram of essence for Réunion, rises to 20 francs per pound in the Philippines, and 4 francs 65 centimes per ounce in Jamaica.

In Manila, the distillers, who are all Germans, buy the flowers from the native inhabitants at the rate of from 1 franc to 1 franc 50 centimes per pound. The picking is brought in the morning in order to subject the flowers to the vapor as early in the day as possible. In the period from July to December the trees furnish the best product, often averaging 100 pounds of flowers to the tree. It requires from 80 to 200 pounds of flowers to make 1 pound of essence.

Under present market conditions the raising of ylang-ylang of a superior quality would be remunerative, even though the yield might not exceed 3 or 4 kilograms per hectare. But it would be necessary to consider, before setting out new plantations, that this product is one for which the market is rather limited, that the synthetic essence is to be reckoned with, and that there are many young plantations that are coming on to increase the present supply of the market. These facts demand serious consideration, especially when it is a question of undertaking the culture on a large scale.

THE LAW PROVIDING FOR A SUGAR-TESTING LABORATORY IN ILOILO.¹

By authority of the United States, be it enacted by the Philippine Legislature, that:

SECTION 1. The Secretary of the Interior is hereby authorized to establish a sugar-testing laboratory in the city of Iloilo, Province of Iloilo, which shall be in charge of a sugar chemist who shall be an employee of the Bureau of Science. This sugar chemist shall fix and establish, on or before the fifteenth day of November of each year, standard samples of sugars number one, number two, number three, superior damp, and current of Iloilo, which shall govern as hereinafter provided during the twelve months immediately following said fifteenth of November.

SEC. 2. In fixing and establishing these samples, the sugar chemist shall take into account the degrees of polarization, the color, the hygro-metric state, the granulation and the crystallization of the samples of each of the several classes of sugar fixed and established by the merchants of Iloilo, and accepted in the markets where Philippine sugar is sold, so far as they are known to him. Merchants may send portions of the classified samples of sugar which they receive from markets in which Philippine sugar is sold to aid him in correctly fixing and establishing standard samples, but failure to receive such samples from merchants shall not operate to prevent the sugar chemist from fixing and establishing standard samples of the different classes of sugar.

SEC. 3. It shall further be the duty of the sugar chemist to correctly classify all samples of sugar that may be delivered to the sugar-testing laboratory for classification by any person. In cases of dispute between contracting parties with respect to the classification of any sugar, any one of them may send to the sugar-testing laboratory a sample of the said sugar for its classification. The result of the classification made by the sugar chemist shall be set forth in a certified report which shall be transmitted in each case to the person sending the sample. A suitable portion of each sample of sugar, the classification of which shall have been thus fixed, shall be deposited in a glass container which shall be closed with sealing wax, on which shall be stamped the seal of the

(¹ Act No. 1896, Philippine Legislature.)

Bureau of Science, and shall be properly marked so that it can be identified, and shall be transmitted to the person sending the sample.

SEC. 4. In every case of dispute between contracting parties as to the class of sugar, a classification made by the sugar chemist, as provided in section three of this Act, shall determine the classification of the sugar in question, except when any one of the parties shall impugn the classification made by the sugar chemist and shall prove that it is incorrect.

SEC. 5. Subject to the approval of the Secretary of the Interior, the Director of the Bureau of Science is hereby authorized to fix charges for the determination of the degrees of polarization of sugar, and for the determination of its color, its hygrometric state, its granulation and its crystallization, provided that the charges so fixed shall not exceed the actual cost to the Government of performing the work.

SEC. 6. The sugar chemist may make analyses of sugar canes, of bagasse, or of mill juices, or other similar chemical investigations for private persons. The scale of charges for all such work shall be fixed by the Director of the Bureau of Science, with the approval of the Secretary of the Interior.

SEC. 7. The sugar chemist may carry on such investigations as may be practicable relative to means which may advantageously be employed in improving the quality of Philippine sugar, and the Director of the Bureau of Science shall from time to time publish the results of such investigations for the benefit of sugar producers.

SEC. 8. Payment for all work performed at the sugar-testing laboratory shall be made to the sugar chemist, and all sums received in payment for work therein performed shall be accounted for as cash receipts of the Bureau of Science, under such rules as the Insular Auditor may prescribe.

SEC. 9. This Act shall take effect on July first, nineteen hundred and nine.

Enacted, May 17, 1909.

PINEAPPLE GROWING IN BATAAN AND BULACAN PROVINCES.

By MARIANO M. CRUZ, *Agricultural Assistant.*

The pineapple (*Ananassa sativa* Lindl.) has never been, and is not as yet, commercially grown in the Philippines. It is true that it is well adapted to most places in the Archipelago where the soil and climatic conditions are so similar to those of its native place in South America. Unfortunately it is grown only to supply the home consumption of the fruit and the demand for the cloth that is made from its fiber. Of course there is some of this cloth exported annually, but this amounts to only about ₱1,200.

PRODUCTION OF FIBER AND FRUITS.

In 1903 there were in all the Islands about 613 hectares of land devoted to pineapple growing, from which about 952,400 pines and 292,400 kilograms of fiber were taken, giving an average production of 1,500 fruits and 470 kilograms of fiber per hectare. The provinces in which the yield of fiber amounts to 15,000 kilograms or over are grouped, with reference to the amount of fiber produced as follows:

Order.	Provinces.	Area cultivated (hectares).	Fiber produced (kilos).	Average per hectare (kilos).
1	Negros Occidental.....	41	46,000	1,122
2	Samar.....	51	30,229	593
3	Bulacan.....	31	18,400	594
4	Cebu.....	25	17,296	692
5	Leyte.....	29	17,086	589
6	Laguna.....	25	15,772	631
7	Batangas.....	27	15,114	560

The following table shows the provinces in which the yield of fruits amounts to 20,000 and upward:

Order.	Provinces.	Area cultivated (hectares).	Fruits produced.	Average per hectare (fruits).
1	Samar.....	51	93,000	1,824
2	Bataan.....	30	46,620	1,554
3	Negros Occidental.....	41	44,400	1,083
4	Tayabas and Marinduque.....	41	42,000	1,024
5	Cebu.....	25	31,200	1,246
6	Leyte.....	29	25,700	886
7	Bulacan.....	31	24,900	803
8	Zambales.....	12	22,700	1,892
9	Cagayan.....	17	21,300	1,253

In the Philippines, Luzon stands first in the list of all the pineapple-producing islands, having more than one-half of the total area and fruit production, while it produces about 46 per cent of all of the fiber.

LEADING PINEAPPLE DISTRICTS.

Some time ago, I visited two of the leading pineapple districts in Luzon, namely, the towns of Orion and Bulacan in the Provinces of Bataan and Bulacan, to make a study of the pineapple cultivation in these places. These two provinces being situated near the coast of Manila Bay their most important industry, of course, is fishing. While it is true that fishing is often very profitable, yet it is somewhat uncertain, like gambling, and not all people can depend upon fishing for their living. The leading residents in these places are anxious to find the best means for fully developing their farms. It was suggested to me, owing to the fact that many of the farmers are not able to understand either the Spanish or the English publications of the Bureau of Agriculture that it would be well to hold an occasional convention in the provinces, similar to farmers' institutes in the United States, so that the farmers would be put in direct touch with men trained in the science of agriculture.

The chief agricultural products grown at Orion are, in their order of importance, rice, pineapples, and corn; while in Bulacan they are rice, sugar cane, pineapples, and ylang-ylang; so that, generally speaking, we can classify the pineapple industry as third in rank of all the industries of these two places.

Orion.—In going over Orion, which is the chief pineapple-producing town in Bataan, I found a whole barrio devoted to pineapple growing—that is, the barrio of Damlog situated on the south side of the town—while some other sections of the town, like that on the west, may be equally adapted to the pineapple industry. Since the insurrection in 1896, the barrio of Damlog had been entirely abandoned by the people who once inhabited it, so that the first pineapple plantations which were established there some five scores of years ago by a Spanish military sergeant, are now almost a jungle left to the mercy of wild pigs and rats.

Bulacan.—In the town of Bulacan pineapples are grown principally in the barrios of San Nicolas, Balubad, Tibig, Pitpitan, and Tabang. The conditions here are somewhat different from those in Orion, due to the fact that better care is given to the plantations here where people live nearer to their plantations than the people in Orion. In both places only a few people are opening up new plantations and the old plantations are not cultivated or fertilized as they should be and therefore produce but little each year.

INDIVIDUAL PLANTATIONS.

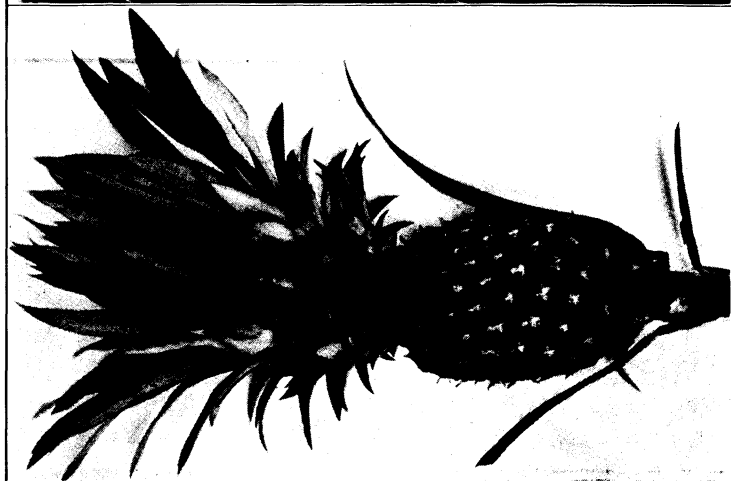
The size of a pineapple plantation in the places I visited ranges from 10 to 50 ares, giving an average of about 30 ares (0.3 of a hectare) for each plantation. However, each of the principal growers in both provinces, namely, Sr. Mariano Grei y Angeles, Sra. Pelagia Estacia, Sra. Romana Labrador, and Sr. Teodorico Tria in Orion, and Sres. Edeudato Lava, Francisco Fernando, Manuel Catindig, Jorge Tablan, Anastacio Rodriguez, Francisco Baltazar, and Sra. Isidora Serpio in Bulacan, own much larger tracts of pineapple land.

VARIETIES.

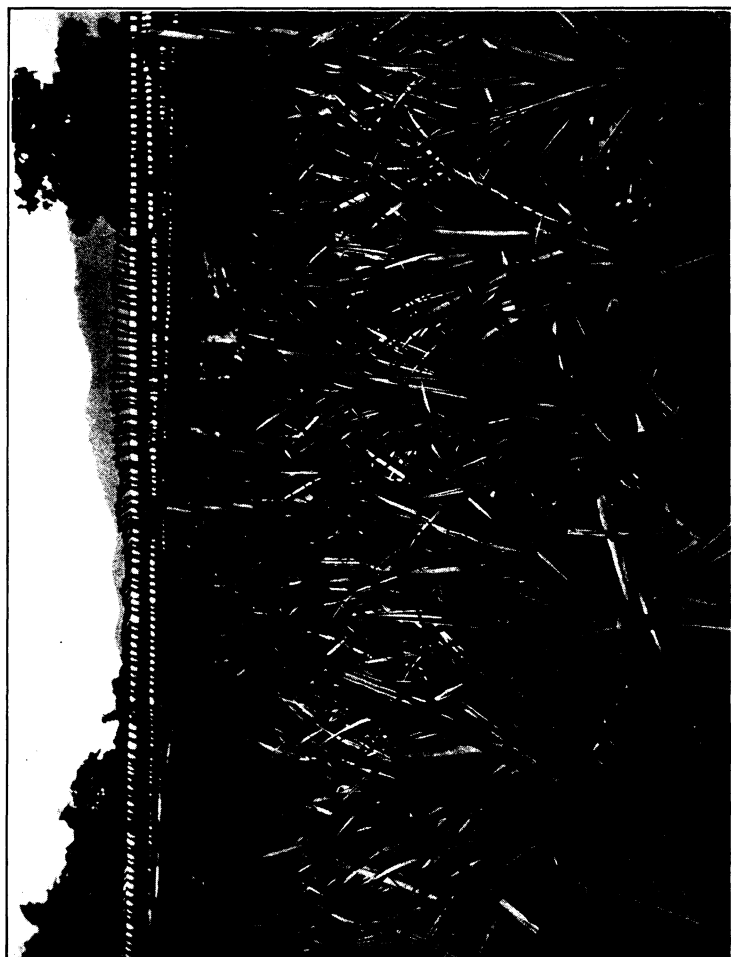
The variety of pineapple that is now raised in Orion has a much larger fruit but is not so sweet as the Bulacan variety. In Bataan the leaves are not used for their fiber as is the case in Bulacan, and the Bataan pineapple, that is said to have been introduced from Bulacan, has apparently been producing larger fruits at the expense of the leaves. Another kind sometimes found in Bulacan is a mestizo variety about the size of the red Spanish. The existing varieties of pineapples in the Philippines, including the Marinduque variety, are supposed to have sprung from pineapples that were introduced from South America by the Spaniards more than a hundred years ago.

METHODS OF CULTIVATION.

On examination of the number and kind of plants in the field, we noted that the plants were set out without leaving any space for a pathway between the rows and that after each plant had produced its full number of ratoons, suckers, and slips, it rendered the harvesting of the fruits amongst the thorny leaves a most difficult task for the farmers. During the harvesting they often chop off the dead leaves and the miniature plants above the soil. This of course serves to thin out the plantation; but as these young plants which are left in the ground grow very thick the plantation may again be turned into an impenetrable field before the next year. The fact that only from 40 to 60 per cent of all the plants bear fruit each year shows not only the effect of close planting, where each plant grows at the expense of the other, but also that selection for the most productive mother plants is not well put into practice. The lack of proper selection and cultivation are also evident in that the plants produce fruits of such varying taste and size (from 0.69 to 1.61 kilograms each). However, it is safe to say that the Philippine pineapple is almost free from any pest or disease, save from what is commonly known as "tangleroot." The leaves produced are from 8.34 to 18.07 decimeters long, but it is to be regretted that the fiber from the leaves is not as yet much used for textile purposes. The leaves of plants after maturing their fruit usually produce one or more suckers and not merely become waste but a source of danger from fire. The present



(a)



(b)

PLATE III.—(a) PINEAPPLE FRUIT GROWING AT SINGALONG; (b) PINEAPPLES GROWING WITHOUT SHADE AT LAMAO.

method of extracting pineapple fiber is merely by scraping the fresh leaves with a sharp knife or a broken piece of glass, leaving the fiber in a clean condition to be dried in the sun.

SEASONS FOR PLANTING AND HARVESTING.

The planting season in the Philippines is during the months of July and August. The young rattoons and suckers are gathered from the old plantations and planted in a clay-loam soil about 5 to 7.5 centimeters deep and from 60 to 80 centimeters apart. At the time of planting such fruit trees as the "lanca" (*Artocarpus integrifolia*), "guayaba" (*Psidium guayava* L.), "santol" (*Sandoricum indicum* L.), "mabolo" (*Diospyros discolor* Willd.) are set out to shade the new plantation. About 40 to 60 per cent of the plants bloom during the months of February and March of their second year of growth, and the fruits are harvested in the months of May, June, and July. In most provinces the fruits are consumed in the locality where they are produced, but in Bataan and Bulacan the product is sold to local dealers who in turn ship it to Manila for sale in the raw condition. Commercially speaking, none has yet been prepared or canned for home consumption or for export. The fruits are usually sold without even being graded for size and quality, all of which means a reduction in the selling price.

ESTIMATED EXPENSE AND INCOME.

The following estimate of the expenses and the income from a pineapple plantation of 1 hectare was given me by some of the growers. This will give prospective investors an idea of the present cost of production and the annual receipts from 1 hectare of land planted with pineapples.

Expense or capital invested.

1. Average cost of a hectare of land (P150 to P300).....	P225.00
2. Tools, "dulós," a spatula-like bolo, and a bolo.....	5.00
3. Cost of clearing of brush and timber land	30.00
4. Cost of planting (20,836 suckers), at P2 per 1,000.....	41.67
5. Cost of harvesting 10,417 fruits, at P1.50 per 1,000.....	15.63
6. Tax, at six-eighths of 1 per cent of the land value, for two years.....	3.36
Total	320.66

INCOME.

From 40 to 60 per cent of the 20,835 plants will produce about 10,400 fruits, which sell at from P3 to P5 a hundred, giving a total income of at least P416 for the first year. This shows that for the first year of production the returns are much greater than the total expense or the capital invested; while for the succeeding years the only expense would be for cultivation and harvesting, which when intelligently carried on with the judicious use of fertilizers would give a continual increase in the income of the grower.

SUGGESTIONS.

With an industry which has received so little attention it would seem proper that some elementary directions be given for the improvement of the Philippine product.

Selection.—We must resort to proper selection or crossing of the individual plants to obtain a greater number of bearing plants, say not less than 80 per cent, to raise larger fruits, not less than 1.38 kilograms, and at the same time a better quality of fruit. Of course to maintain such desirable characteristics we must give the field proper cultivation and use of fertilizers.

Cultivation.—In the way of cultivation, hoeing can be done three or four times a year, enough to stir the surface of the soil around each plant to hold the moisture as well as to kill the weeds. In the first place, a sandy soil should be selected as it is usually free from obnoxious grasses and it forms a desirable bed for the pineapple, owing to its great looseness and porosity. The superfluous leaves, ratoons, suckers, and slips should all be destroyed, unless the ratoon or the lowest sucker must be saved to take the place of the mother plant. Good cultivation will act as a remedy to the disease known as “tangleroot” which is characterized by the roots growing round and round the stem or tap root in search of food instead of reaching out into the ground. Of course, to facilitate hoeing and cleaning, an ample space between the plants should be allowed, for instance, about 80 centimeters between the plants in rows about 120 centimeters apart.

Fertilizers.—At the end of a period of about eight years the old plantation must be all cleaned out and plowed under with some manure or fertilizer to restore the elements which have been taken from the soil. It has often been said that our soils in the Philippines are very fertile, but “Where does their fertility go to?” It often goes to waste without farmers paying any attention to returning it to the soil. It has been found by scientific agriculturists that an application to the soil of the proper kind of fertilizers containing nitrogen, potassium, and phosphorous in the necessary proportions will improve the fruit or the plant, and sometimes both, and thus increase the market value of the product. It is therefore necessary for Filipino pineapple growers to apply fertilizers to their soils so as to provide them enough of the necessary plant foods for their proper development. Pineapple fields should be given at least two applications of fertilizer each year. The plants should be fertilized the first time immediately after their fruits have been harvested, and again about two months previous to blossoming. The last application should contain a large amount of potash to improve the quality as well as to develop the size of the fruit.

The following composition is taken from Bulletin No. 8 of the Porto Rico agricultural experiment station and shows the necessary elements and the amount of such mixtures which should be used for every

1,000 plants. A sufficient quantity of tobacco dust should be dropped into the heart of each plant; the tobacco serves as an insecticide as well as a fertilizer. The application per 1,000 plants following the harvest should consist of about 19 kilograms of dried blood, 14 kilograms of high-grade sulphate of potash, and 13.34 kilograms of acid phosphate; while the second application may be made of the following combination: 18.4 kilograms tankage, 22.08 kilograms of low-grade sulphate of potash and 5.98 kilograms of basic slag.

Canning factories.—The desire of many people to establish pineapple-canning factories in Manila must be known to the growers so that the latter can be induced to produce fruits of a desirable size and quality for shipping purposes. There is also a demand, from some firms in Manila, for pineapple fiber, and the planter might just as well take advantage of this product which is usually left in the field to decay.

PINEAPPLE PRODUCTION IN OTHER COUNTRIES.

Before closing this article, we must take a glance at the situation in the principal pineapple-growing countries of the world in order to realize the true importance of the industry. Let us look first at the United States and one of her island possessions, Hawaii. The State of Florida produces annually about 15,000,000 fruits; while in Hawaii, where planting of pineapples has just been started, it is estimated that 4,560,000 fruits will be produced in 1910. To take care of this product, Honolulu, the capital of Hawaii, has established a canning factory that is claimed to be the largest in the world, with a capacity for canning about 132,000 fruits every day. At present, Singapore produces the most pineapples, supplying nearly all England and the European Continent with an annual export of about 20,313,424 canned fruits. The variety that is most extensively grown in the places mentioned above is the "red Spanish," while the other varieties raised are the "Abbaschi," "smooth Cayenne," "Porto Rico," and "Natal canning." Some of these varieties are now being tested at the Government experiment stations along with our native varieties. With favorable soils and climatic conditions, with a growing interest and enthusiasm on the part of Filipino farmers and business men for improved methods, we could soon place the Philippines side by side with the places above mentioned, in supplying the world's demand for pines.

CONSERVATION OF THE NATURAL RESOURCES OF THE PHILIPPINE ISLANDS.¹

IMPORTANCE OF CONSERVATION.

By the conservation idea may be understood a conscious purpose on the part of the Government and the people to economically handle the natural resources so that they be not wasted but rather improved, where possible, in their productivity and usefulness. It is a recognition that all natural resources are more or less of a heritage which we should take care of and properly handle so that posterity will not have to suffer for our lack of foresight. It is an inspiring and patriotic idea—this of living with reference to the welfare of generations yet unborn and for the future greatness and prosperity of the country, as well as for our own immediate wants.

The conservation idea in the United States developed from a realization that the country would be facing a timber famine in about thirty years unless something were done to stop needless waste and to secure new crops of timber where the mature trees were removed. "The forest problem opened the eyes of the people to the condition of our natural resources as a whole. It was seen that our national progress, even our national existence, depends upon reform in our methods of using the natural riches of the land; that it was time to set our national house in order, to take stock of our resources, and to lay plans for their wisest use in the future."² It was with this idea in mind that the President called the famous "Conservation Congress" of May, 1908, to which were invited the governors of the States and men of national prominence, familiar from experience in business life with the four great classes of resources—the forest, waters, mines, and the soil.

OPPORTUNITIES FOR CONSERVATION BY THE INSULAR GOVERNMENT.

The opportunities for securing conservation by the Insular Government, or the economic handling of the natural resources of the Philippines, are practically unlimited, as all but a small percentage of the land is held by the Government. The four great classes of resources—the forest, inland waters, mines, and the soil—are all contained in the land, so

¹ Extracts from "Conservation of the Natural Resources of the Philippine Islands," prepared under the direction of George P. Ahern, Director of Forestry by W. D. Sterrett, Forester, Bureau of Forestry; Philippine Education, Vol. VI, No. 1, June, 1909.

² Quoted from "A Primer of Conservation," Circular 157, U. S. Forest Service.

that conservation may be considered identical with the proper disposition and use of land public and private.

The Insular Government has the chance of limiting the disposition of public domain to individuals who will properly develop and improve it; while it can reserve land where it is for the best interests of the public at large, as is the case where the land should be held in forest for protection to watersheds and for the continuous supply of timber.

In the States most of the land has passed into the hands of private owners; so that the chances for conservation by the Government there can not be compared with the chances in the Philippines. In the economic development of the States there has been much unnecessary waste. Professor Shaller, a great American geologist and scholar, says: "Of all the sinful wasters of man's inheritance on earth, and all in this regard are sinners, the very worst are the people of America."

In the Philippines the Government has the opportunity to profit by the example of the land policy of the United States by which much of the public domain passed into the hands of unworthy individuals, to be spoiled and impoverished instead of improved and made richer. There are large areas of mountain land in the States which should have always been held by the Government as protective forest, which is now denuded and impoverished waste land.

Conservation work by the Government may be classified under two heads: (a) Management of public natural resources; (b) educational work to encourage private owners in rational and economic management. In the United States most of the work has to be along the latter lines—as, for example, the work of the Department of Agriculture in promoting scientific farming—as the Government has given away most of the public natural resources.

RELATION OF DIFFERENT BUREAUS OF THE INSULAR GOVERNMENT TO CONSERVATION.

Almost every Bureau of the Insular Government is concerned directly or indirectly with the conservation of the natural resources of the Islands. Conservation, however, as an expressed and influencing idea has as yet little to do with the actual workings of the Bureaus, except in the case of the Bureau of Forestry. The Bureaus whose work is most directly concerned with conservation are Lands, Forestry, Science, Agriculture, and Education.

Bureau of Lands.—This Bureau has charge of the important work of disposing of the public domain in accordance with the laws pertaining to the disposition of Insular lands. It is important to conservation that this work be very carefully carried out and that no public land pass into private hands by fraudulent methods. This Bureau has charge of land-survey and land title work, which should be very strictly executed.

Bureau of Forestry.—This Bureau has control of all public forests,

including the disposal of the timber, and has the permanent control and management of all land which is more valuable for growing timber and for the protection of watersheds than for other purposes. From a conservation standpoint this is the central Bureau of the Government, since the most important work which can be done by the Government in conservation is in holding as public forest reserves, under rational forest management, sufficient land for maintaining a continuous timber supply and for the protection of watersheds. Nothing is more vital to the general welfare of the Islands than the carrying out of a proper forest conservation policy.

Bureaus of Science, Agriculture, and Education.—The work of these Bureaus in the promotion of conservation is along educational lines—education of private owners in economic handling of natural resources—and in the collection and classification of data useful to the Bureaus in charge of public natural resources.

The Bureau of Science is carrying on scientific investigation work along botanical, dendrological, biological, entomological, zoölogical, chemical, and mineral lines which will be of great assistance to private individuals and Government Bureaus in the economic handling and development of the natural resources of the Islands.

The Bureau of Agriculture is promoting the practice of scientific and up-to-date agriculture and is aiding the farmer in the most economic utilization of the resources of the soil.

The Bureau of Education has the work of familiarizing, in the schools, the rising generation with the purposes of conservation, both from ideal and practical standpoints, showing how it is for the welfare of the State and of the individual to practice economy in the handling of natural resources.

The work of most of the Bureaus of the Insular Government bears more or less on conservation. For instance, the Bureau of Constabulary is of great importance in the patrol of public lands and forest reserves to stop trespassing, and in protecting the permanent settler or farmer; the Bureau of Public Works has charge of roads, irrigation, well boring, and other improvements which help in the economic development of natural resources; the work of the Coast Survey and all map work is also important for purposes of locating and taking stock of natural resources.

THE ADOPTION OF A CONSERVATION POLICY BY THE INSULAR GOVERNMENT.

The Government of the Philippine Islands, through its various Bureaus, is handling the natural resources of the Islands in a more or less economic way, but there is not as yet a conscious conservation policy underlying its work which considers the welfare of future generations of almost equal importance to that of the present. It is thought that the conservation idea is of such importance that it should be consciously

adopted by the Insular Government as a basic principle and factor, influencing the work of all its Bureaus. With this end in view the Insular Government should draw up and adopt a definite conservation policy and the work of the different Bureaus should be carried on more or less with the idea of furthering this policy. Such a policy would serve to unify and correlate the work of all the Bureaus and give it added life and meaning. It should prove a source of inspiration to employees in the Government service and tend to arouse an *esprit de corps*. It should bring about hearty coöperation in the work of the various Bureaus, which is essential to the proper handling of the natural resources of the Islands.

**SUGGESTIONS AS TO WHAT A CONSERVATION POLICY FOR THE
INSULAR GOVERNMENT SHOULD INCLUDE.**

The following suggestions are made as to what a conservation policy for the Insular Government should include:

1. A general declaration of principles as to the stand of the Insular Government on conservation, similar to that adopted by the Conservation Congress, as previously quoted in this article.

2. Work of many of the different Bureaus of the Government to be emphasized and outlined more or less with a view to promoting conservation.

- (a) Bureau of Lands: In the work of this Bureau it is important: That a topographic survey be accomplished as rapidly as possible of the entire Archipelago; that the status of all land be cleared up, and land held by individuals without just title or claim be taken back into the public domain and opened to bona fide homesteaders; that maps showing the exact location of the public domain open to settlement be made; that every effort be made to prevent fraud in the disposition of public domain; that in accordance with new land laws, a more rigid system be carried out in regard to obtaining title to public domain.

- (b) Bureau of Forestry: The work of this Bureau should be made the main or pivotal work in governmental conservation. The chief work will be in setting aside and managing large areas of public land or permanent forest reserves closed to settlement, for timber and water purposes. There is in addition a large area of forest land which will make excellent agricultural land when cleared, which should be temporarily withdrawn from settlement and managed for the production of timber until the country really needs more land for homestead purposes. There is an abundance of good land without merchantable forest to which there is no just title or claim, which is therefore really public domain, and it is good economy to confine homesteads and settlements to this, until it is all appropriated, and not allow valuable timber to be wasted. The Bureau of Lands has much work to do in the way of determining public domain which is unjustly claimed to the exclusion of new homesteaders. The work of the Bureau of Forestry will include the securing

of the sale and exploitation of mature timber on forest reserves under proper forestry methods, and thereby will derive a large revenue for the Insular Government.

(c) Bureau of Science: The work of this Bureau to be directed more or less along lines of investigation which will be most useful from a conservation standpoint.

(d) Bureau of Agriculture: Under this Bureau comes the work of agricultural investigation and the promoting of the practice of intensive, scientific agriculture by the farmers.

(e) Bureau of Education: The function of this Bureau, from the point of view of conservation, has already been stated.

(f) Bureau of Constabulary for policing of forest reserves and protection of farmers.

(g) Bureau of Public Works for road work which will facilitate the agricultural development of the country; and the execution of irrigation projects which will increase the area in the Islands which is of value for homesteads.

The work of other Bureaus, besides those discussed, will have more or less bearing on conservation, and their work should be made to facilitate, by helpful coöperation, that of the Bureaus actively engaged in the work.

AGRICULTURE IN JAPAN.¹

By FRANK G. CARPENTER.

[Printed by special permission of the author.]

[Copyright, 1909.]

During the past two months I have been traveling through the farming districts of Japan. They should be an object lesson to the United States. The country is kept like a garden, and it is as fat as the valley of the Nile. A great part of it, however, is covered with forests, much of it is mountainous, and, all told, the cultivated parts are half as big as the State of Ohio. Nevertheless, this small area is now feeding more than 50,000,000 people, or more than one-half as many as we have in the United States. It produces every year 100,000,000 bushels of rye, barley, and wheat; 250,000,000 bushels of rice, and nearly 100,000,000 pounds of tobacco. It grows 56,000,000 pounds of tea, 10,000,000 bushels of silk cocoons, as well as buckwheat, millet, beans, indigo, cotton, and hemp. The rice crop alone is worth \$200,000,000 per annum.

AMONG THE FARMS.

I can give you no idea of the intensive cultivation which is going on here. The whole country is divided up into patches, ranging in size from that of a bed quilt to tracts of an acre or so, and every bit of it is as clean as a Government flower bed. There are no fences, and one looks over a crazy quilt, made up of patches of many-colored crops, bound together with the green grass which forms the boundaries of the fields. The Japanese farms are, on the average, not more than 2 acres in size, and only 15 per cent of all the holdings are of more than 4 acres.

The ownership is widely scattered. There are, altogether, about 8,000,000 families engaged in agriculture, and many of these have their whole living from 2 acres of ground. Others have small tracts of their own and rent more. As it is to-day, only about one-half of the land is worked by the owners. The rest is farmed by tenants who pay a proportion of the crops or high money rents.

But come with me and take a look at the farming country. It is

¹ From the Detroit Free Press, April 4, 1909.

nothing like that of America. There are no barns nor haystacks. There are no big fields and no cattle nor horses. The ordinary Japanese farmer would look upon a Pennsylvania bank barn as a temple, and worship in it if he saw it. He would look upon our sheep as so many wild animals, and a Percheron horse or a Shorthorn cow would be as much out of place on his little tract as the traditional bull in the china shop. This is so, notwithstanding there are something like 2,000,000 cattle and horses in Japan. Most of them, however, are used for freighting or as draft animals to carry goods over the country. They are always kept up and one never sees them roaming about or feeding alone in the fields. The cart is the chief farm vehicle, and it is more often hauled by men or bullocks than by horses.

ALL HAND LABOR.

On the other hand, the American farmer would be lost if he came to Japan. If he brought along a reaping machine, his horses would tramp down his neighbor's crops while turning it around in his fields; and, as for a thrasher, the people would mob him for taking away the work from the laboring classes. He could not use his plows unless he bought up a whole county, and his fences would be useless to say the least. He would be surprised at every step at the methods of good cultivation. He would see wheat, oats, and barley planted in series and transplanted again in rows a hand's breadth apart. He would see these crops weeded as we weed onions, and would eventually see them reaped with sickles close to the ground. After cutting, the straws are laid end by end in little sheaves and tied with a wisp at the bottom. Each sheaf is then pulled apart, and hung over a rope or a pole, like washing, to dry. Later on, the heads of the grain are cut off with a knife, and thrashed out with a flail. In many places the grain is winnowed by throwing it up into the air, and in others the farmers use separators or hand-fanning mills turned by a crank.

The work of preparing the land is quite as hard as the planting and harvesting. Most of the country is dug over again and again every year. It is chopped with mattocks, which have blades 4 or 5 inches wide and as long as your arm. These are so made that the man or woman who uses them must bend double while digging. I have seen women with babies tied to their backs thus working in the rice fields. Their kimonas are tied up over their knees, and they wade through the mud as they set out the plants. I know of no crop which takes so much work as rice, and this is the money crop of Japan. It ranks here as wheat does with us, and Japan is rich or poor according as the rice crop does well or ill. In times past the royal taxes were paid in rice, and to-day the financiers watch the growth of this crop as our people do corn, cotton, and wheat.

THE RICE CROP.

The greater part of the rice crop is raised by irrigation. The fields are made at different levels, and the water from the hills is run by canals from one to the other. The ground is prepared during the winter. It is covered with manure and made as level as the floor. Along about the first of April it is broken up with a hoe or spade and then flooded.

In the meantime the rice plants have been grown from the seeds in nurseries. They are taken up and scattered over the water as needed. Then the men, women, and children of the family tie up their clothes and wade out in the mud. They set the plants out in rows of bunches of four or six plants each. They are so close together that it takes from 1,500 to 3,000 bunches per acre. The water is left on and the rice grows rapidly.

The planting is done about June. The rice soon appears above the water and within a few weeks the whole of the country is a beautiful green. Almost every plant is watched. One sees big-hatted farmers dressed in blue gowns trotting along through the fields. If they see a plant out of shape or not deep enough in the water, they will reach down and fix it. In this way every rice stalk yields its best product.

The harvesting of the rice is even more difficult than harvesting wheat. After the grain is cut, it has to be pulled from the straw and be husked before it can be used. The grains are still in the husks, and the husks have to be taken off before they can be used. This is mostly done by hand, the grains in the shell being put in a mortar and pounded with a wooden pestle until the kernels are free. Some of the farmers have rice mills, worked by water, and others hulling machines, worked by hand. Much of the rice is winnowed by machinery, small hand mills being used.

FAMILIES WORK IN FIELDS.

The Japanese farmers seldom live on their farms. They have little villages of wooden houses, thatched with straw. Here they come at night, and from here they go out in the morning to work. The people generally work in gangs. You seldom see a man alone in the fields. A whole family—father, mother, boys, and girls—all work together. There are many hired hands, and the wages paid are exceedingly small. It is a poor part of the United States where a farm hand is not worth 50 cents a day and his board, or where he gets less than \$15 a month, if employed the year round. The wages here, without board, are 16 cents per day for men and 10 cents for women, with much less for children. The work goes on from sunrise to sunset, and it is fully as hard as any on our farms at home. Hands employed by the year receive proportionally less. Including board, men are paid about \$58 a year, or less than \$5

a month; the women get about \$50 or a little more than \$4 a month. In a Government report of 1906 I see that men farm laborers were getting less than \$20 a year, and women less than \$10. There is a steady rise going on in wages of all kinds, and these can not remain as they are.

In some cases, farm laborers hire out to work only on alternate days, devoting themselves to their own little tracts of land during the rest of the week. Boys are often bound out to farmers for terms of from five to seven years, their pay being little more during the time than their board and clothes. Of late, I understand, there has been a considerable movement of the farming classes to the cities, and just now there are many who are emigrating to Korea and Manchuria.

EDUCATING THE FARMERS.

Indeed, the farmers of Japan are rapidly changing. There are public schools everywhere and the boys and girls of the country communities attend them. Nearly every man can read and write, and most of the landholders know what is going on as to scientific cultivation. The Government is doing a great deal along the lines of agricultural education. It has big agricultural colleges at Tokyo and Sapporo; and there are thirty-six smaller colleges which are teaching theoretical and practical farming in the towns and prefectures. There are special colleges in Kyoto devoted to the art of silk culture, and instruction is also given in tea raising and in the other specialties of Japan.

The Government has 310 traveling lecturers, who go from town to town and from district to district, preaching advanced agriculture to the farmers and instructing them as to insects, fertilizers, and various crops. Some of these men are present at every agricultural show, and attend also to the experimental farming carried on at the public expense.

Japan has now more than 200 experiment stations, and there are other experiment stations established by the farmers themselves. The first of these stations were organized by men from our Agricultural Department, and there have been many American professors in the colleges. Among the experiment stations is one for the study of the tea plant and of all modes of curing the leaves and preparing them for the market. There is also an imperial silk farm and an imperial cattle and horse-breeding establishment.

STOCK FARMING.

Within the past few years Japan has done a great deal to improve its live stock. It had practically none of much value at the time that Commodore Perry came here. It has now a million cattle and a million horses, and one can buy good beef at all of the ports. When I first came to Japan it was impossible to get anything but tinned butter. There are now numerous dairies, and fresh butter, unsalted, is sold in

most of the cities. The masses of the people use neither butter nor meat. They live upon fish, rice, and vegetables, which they eat with a sauce called *toy*.

JAPANESE HORSES.

The Japanese are doing all they can to improve their horses. The Emperor has a number of studs and horse farms, and his men are importing animals for their improvement every year. He has Arabs, trotters, thoroughbreds, and hackneys, altogether numbering about 500 stallions and mares. There is now a horse administration bureau, which is under the control of the cabinet, with an ex-minister of state as its chief. The business of this bureau is to improve the Japanese stock with the special object of furnishing better animals for the army. I understand that 1,500 stallions of foreign breed are to be purchased and distributed to the chief breeding centers.

At present most of the horses are stocky ponies of Mongolian breed. They have been somewhat crossed with Percherons, and as a result they are very strong and hardy. I see some of them hauling enormous loads on carts through the streets of the cities. They are always hitched up singly, and the driver invariably walks, leading the horse.

HOW THE STATE HELPS THE FARMERS.

This country has a live up-to-date department of agriculture. It is associated with the ministry of commerce, and it deals with almost everything that comes out of the soil. It has branches devoted to insect diseases, to fertilizers, and to stock raising. The nation is doing all it can to make two blades of grass grow where one has grown before; and it is trying to open up new areas for cultivation. Japan has been farmed for more than two thousand years, and it is difficult to find much good, unoccupied land. Every available foot seems to be used, but by changing the hills, and more particularly by consolidating the holdings of owners who have small tracts in the same district, much has been done. As it is now, the fields are of all shapes. Here one spreads out like a fan, there one is square, and further on is a triangular patch. The country is made up of patches of all shapes and sizes, but none contains more than an acre or so.

INDUSTRIES CARRIED ON AT HOME.

At present the farming country is overstocked with people, and most of the farmers have some sort of house industry which they carry on while not engaged in cultivating the soil. In this way the winters are not wasted as in our country, and the nation materially adds to its manufactured products. This phase of agriculture is encouraged by the Government.

Here are some of the occupations that the farmers follow during the idle seasons. They make starch, macaroni, jam, and dried fruits. They

manufacture straw braid, mat facing, and the mats used for rearing silkworms. They make baskets of all kinds, bags for charcoal, straw ropes, straw raincoats, and straw hats. In many of their houses weaving goes on, and in some they manufacture silk and paper. Some of them burn charcoal, others make lime, and others refine camphor.

One feature of the Government help is a part of the Japanese banking system. There is one big bank, the Hypothec, with a capital of \$5,000,000 which loans out money to farm districts and to farmers' associations and even to individuals upon real estate security. It gives long time loans, payable by installments and at a low rate of interest, and it also issues savings bonds, in denominations as low as \$2.50, for the encouragement of thrift.

ESTIMATED COST OF A COCONUT PLANTATION IN THE FEDERATED MALAY STATES.¹

ESTIMATE FOR OPENING UP AND BRINGING INTO BEARING 500 ACRES.

		English currency.		
	Singapore currency.	£	s.	d.
<i>First year.</i>				
Felling and clearing, at \$10 per acre	\$5,000	583	6	8
Draining, at \$12 per acre	6,000	700	0	0
Cost of seed (40,000 seeds), at 8 cents each	3,200	373	6	8
Fencing, at \$2 per acre	1,000	116	13	4
Lining and planting, at \$2 per acre	1,000	116	13	4
Cooly lines	250	29	3	4
Tools	250	29	3	4
Bungalow	1,200	140	0	0
Stationery and postage	50	5	16	8
Medical	50	5	16	8
Premium, at \$3 per acre	1,500	175	0	0
Quit-rent, at \$1 per acre	500	58	6	8
Weeding, first six months, at \$1 per acre per month	3,000	350	0	0
Contingencies	500	58	6	8
Superintendence	3,000	350	0	0
Total	26,500	3,091	13	4
<i>Second year.</i>				
Quit-rent	\$500	58	6	8
Weeding	6,000	700	0	0
Superintendence	3,000	350	0	0
Total	9,500	1,108	6	8
<i>Third year.</i>				
Quit-rent	\$500	58	6	8
Weeding	4,200	490	0	0
Superintendence	3,000	350	0	0
Suppling	300	35	0	0
Total	8,000	933	6	8
<i>Fourth year.</i>				
Quit-rent	\$500	58	6	8
Weeding	3,500	408	6	8
Superintendence	3,000	350	0	0
Total	7,000	816	13	4

Fifth year, \$7,000 (£816 13s. 4d.); sixth year, \$7,000 (£816 13s. 4d.); seventh year, \$7,500 (£875); eighth year, \$7,500 (£875).

¹ From Agricultural Bulletin of the Straits and Federated Malay States, Vol. VIII, No. 5, May, 1909.

ESTIMATED RETURNS.

Sixth year, 10 nuts per tree; seventh year, 30 nuts per tree; eighth year and afterwards, 50 nuts per tree.

Value of nuts, \$20 (£2 6s 8d.) per 1,000 nuts; 60 trees to the acre.

Profit and Loss.

Year.	Expenditure.		Value of nuts.		Profit on each year.	
	Singapore currency.	English currency.	Singapore currency.	English currency.	Singapore currency.	English currency.
First.....	\$26,500	£ 3,091 13 4				
Second.....	9,500	1,108 6 8				
Third.....	8,000	983 6 8				
Fourth.....	7,000	816 13 4				
Fifth.....	7,000	816 13 4				
Sixth.....	7,000	816 13 4	\$6,000	£700		
Seventh.....	7,500	875 0 0	18,000	2,100	\$10,500	£1,225
Eighth.....	7,500	875 0 0	30,000	3,500	22,500	2,625
Ninth.....	7,500	875 0 0	30,000	3,500	22,500	2,625
Tenth.....	7,500	875 0 0	30,000	3,500	22,500	2,625

Total expenditure in ten years, \$95,000 (£11,083 6s. 8d.)

Gross value of produce, \$114,000 (£13,300).

Percentage of annual profit to capital expended

Seventh year	17.79
Eighth year	38.12
Ninth year	38.12
Tenth year	38.12

CURRENT NOTES.

THE NEW TARIFF LAW.

President Taft forced the United States Senate committee to recommend the admission, free of duty, from the Philippines of 150,000,000 cigars, 300,000 pounds of wrapper tobacco, 1,500,000 pounds of filler tobacco, and 300,000 tons of sugar annually, and that all other Philippine products except rice shall have free entry.

The President's plan is that the principles of protection shall be applied to the industries of the Islands. This means reciprocal free trade with the Philippines, with a limitation on the amount of sugar and tobacco to be imported annually.

GOVERNMENT GUARANTY OF PHILIPPINE TOBACCO.

Probably one of the best movements for the protection of Philippine tobacco growers and manufacturers is the step taken by the National Government to guard against the introduction of inferior grades of tobacco leaf, cigars, cigarettes, etc., into the United States and thus discredit the product of the Philippine Islands, as was done with Porto Rico tobacco when free trade was granted to that Island.

The Insular Government, acting on the recommendation of the Bureau of Insular Affairs, decided to provide for the careful inspection and grading of all tobacco shipped from the Philippines to the United States, and it is the intention of the Government to allow only the best grades to be exported, or to see that the Philippine product is not placed upon the United States market without being properly graded and labeled so that the people of the United States will know exactly what they are buying.

It is quite likely that with the increased demand for high-grade Philippine tobacco which will result from the opening of the United States market, there will be a tendency on the part of the growers and manufacturers, as well as the Government, to endeavor to produce Philippine leaf of the best quality in greater quantities. The very high tariff on the Sumatra wrapper and the unsuitability of the Connecticut leaf for use with Philippine filler will create a demand which must be filled from the tobacco fields of the Islands.

AMBALANGAN-DALIN IRRIGATION PROJECT.

It seems altogether probable that the first irrigation project which will be carried out and completed is the Ambalangan-Dalin irrigation scheme, near the Agno River in the mountains of Pangasinan. At this place a dam can be built which will flood a great part of the upper Pangasinan. Every survey shows an increasing area that can be effectively irrigated in the locality, so that the Government now plans to carry water to approximately 18,000 hectares of rice land. It is expected that the work on this project will begin soon after the rainy season. As is well known, an annual appropriation of ₱750,000 has been provided by law for irrigation work.

HEMP-STRIPPING MACHINES.

Some time ago Manila hemp dealers and those interested in hemp plantations had the privilege of seeing a demonstration of the work done by a very simple and practical hemp-stripping machine which is the invention of Mr. H. H. Behrendt, of New York. The machine, with a gasoline motor of the same class as that used in small motor boats or launches, is very compact and can be easily moved from place to place on plantations, which in this country is a very great convenience, saving the transportation of hemp stalks for considerable distances.

More recently Mr. Molo, an Iligan planter, has given an exhibition of an improved hemp machine for which he claims many superiorities in construction and capacity to properly clean a large amount of hemp per day.

The progress made by different inventors of such machines is decidedly encouraging and without doubt a very satisfactory machine will be placed on the market in the near future. Another item to which attention has already been called is that machine-stripped hemp has a considerably greater tensile strength, which will naturally lead hemp growers to use stripping machines in preference to having their hemp stripped by hand.

TELEPHONE AND TELEGRAPH SERVICE FOR THE ISLAND OF PANAY.

By authority of the Acting Governor-General, the Acting Executive Secretary advertised for sealed proposals for the franchise for a telephone and telegraph system on the Island of Panay. This call for bids closed August 12, and one firm, Messrs. Bryan & Landon, who are operating a similar line in the city of Cebu, was the only bidder. This franchise was provided for by Acts Nos. 1842 and 1916 of the Philippine Legislature. The successful bidder is required to begin operations by installing the said telephone and telegraph lines within eighteen months after the franchise has been granted.

THE SIASI PLANTATION AND TRADING COMPANY.

The site of the Siasi Plantation and Trading Company is about 40 miles south of Jolo, in the Moro Province. This plantation consists of 2,500 acres, the limit allowed by law. The company has been working about two years. Its officers are: President and treasurer, Mr. George R. Harvey, Solicitor-General; vice-president, Mr. Carson Taylor, publisher of the Daily Bulletin; secretary, Dr. H. S. Kneedler, and superintendent, Mr. N. M. Holmes.

About 250 acres of this plantation have been planted to rubber, coconuts, peanuts, and tapioca. The tapioca and the peanuts are planted between rows of rubber and coconut trees. These plants have done exceedingly well and the first week in August saw the first fruits in the shape of a shipment, received in Manila, of four large sacks of shelled peanuts which were delivered to Mr. M. A. Clarke, and thirty-four sacks of cassava starch which are being sent to New York, San Francisco, and other markets as samples. It is hoped that other plantations of this sort will be started in different agricultural sections.

IRRIGATION WORK IN BULACAN.

One of the largest irrigation works in the Islands is that to be constructed in Norzagaray for the irrigation of over 25,000 hectares of rice land. The water for the system will be drawn from the Angat River; its estimated cost will be about ₱1,200,000. This project, like the Ambalangan-Dalin, is still subject to final action by the Government, but there seems to be little question regarding this phase of the matter providing the people concerned give it their support.

JAVA EXHIBITS FOR THE CARNIVAL.

The officials of the Carnival Association have received a communication from the government officials of Java, through the consul for the Netherlands, P. K. A. Meerkamp van Embden, of this city, in which these gentlemen state that they have received the invitation to participate in the Philippines Carnival and that they will be pleased to send representatives and exhibits of their products, which, of course, will be a prominent feature of the Carnival for 1910.

PROVINCIAL FAIRS AND EXHIBITIONS.

The bill providing for the holding of provincial exhibitions of the products of the industry and agriculture of different provinces, which was introduced in the Assembly by Delegates Alvear, Paterno, and Leon Guerrero, was a most commendable move in the right direction. The purpose of such expositions of course is to stimulate the agricultural and industrial development of the provinces. The plan provided for in the bill was that expositions should be held in the different provinces or

groups of adjacent provinces during the first two weeks of April, every six years, beginning in 1911. The only objection to this plan is that it does not provide for holding expositions often enough and there should be no set time at which all provinces should hold expositions, as the time and frequency of such fairs or expositions must be determined in a large measure by the financial condition of the provinces interested and the industrial and agricultural progress made. We hope that this measure will be taken up again at the next meeting of the Legislature and that steps will be taken to not only make it possible, but to encourage the provinces to hold such fairs and expositions.

**CIRCLE FOR THE STUDY OF THE SOCIAL AND ECONOMIC
CONDITIONS IN THE PHILIPPINES.**

During the third week of the meetings of the Teachers' Assembly, meetings were held under the direction of Doctor Barrows in the course of which a circle for the study of social and economic conditions in the Philippines was organized. The "circle" proposes to make original investigations in the conditions surrounding the daily life of the people, to collect data regarding conditions, and to publish the results and conclusions drawn for the information of its members, and especially to provide suitable subject-matter for the study of these subjects in the secondary grades of the public schools. The work is to be carried on under the direction of a central committee.

VILLAGE AND RURAL IMPROVEMENT SOCIETIES.

A series of articles on this subject by the Director of Education is being published in "Philippine Education" for the fourth grades. From the name of the societies we should think that a great deal of good could be accomplished for the improvement of country life by work properly carried on under this heading. It is hoped that the village and rural improvement societies organized in the intermediate schools in the Islands will take up practical subjects and that they will be led, through their supervisors and teachers, to do a great deal toward improving the present conditions of rural and village life. It is earnestly to be hoped that they will not spend their time in talking about history, politics, and government, but that they will take up specific lines of improvement and show the people how better conditions can be brought about and what can be done along various lines to change the existing conditions for better conditions. What we need is action; not merely knowledge, but actual work in some definite direction, which will count for better conditions at once.

MANILA CIGARS FOR THE UNITED STATES.

A single order for 85,000,000 cigars has been placed by a well-known American concern with three of the leading tobacco factories in Manila. It is said that this firm is in an excellent position to push the sale of

Philippine goods throughout the United States. This order includes cigars of all sizes, but mostly those familiar to Army people, which will be put on sale in the United States at 5 cents. A real handmade perfecto for a "nickel," it is believed will appeal to American smokers as a great bargain. Among the brands that have been included are the "José Rizal," and the "Aguinaldo" (a new cigar).

Advertising is being prepared on a large scale to present these tempting offers to the people in the United States. A series of beautiful scenes of life in the Philippines, which it is believed can not fail to attract attention in the States, is being painted by artists who are said to be especially capable along these lines.

ADDITIONAL VETERINARIANS FOR THE BUREAU OF AGRICULTURE.

The Acting Director of the Bureau of Agriculture has cabled to Washington for twelve eligible veterinarians. These men should arrive within the next few months. With these new men the force of veterinarians in the Islands will be increased to 44, 31 more than formerly employed.

In the past the work of the Bureau has been greatly handicapped by the lack of veterinarians, as there were but 13 men for all of the provinces, and five of these were stationed in Manila, Iloilo, and Cebu, leaving but eight veterinarians for all of the provincial work. With but eight men it has been impossible to effectively combat outbreaks of animal diseases. With the force increased to 44 it is believed that the whole Archipelago can be adequately covered so that all animal diseases can be reduced to a minimum and outbreaks of rinderpest can be promptly stamped out.

NOTES FROM OTHER FIELDS.

PINEAPPLE GROWING IN THE FAR EAST.

In the Hawaiian Islands the pineapple growing and canning industry is rapidly extending. The amount of these fruits shipped to the United States in 1908 was valued at ₱1,443,718. The present acreage of pineapple land in Hawaii is estimated at 4,540 acres, from which it was expected to harvest from 350,000 to 400,000 cases for the year ending May 31, 1909.

In Formosa pineapples were formerly grown only for local consumption as the cost of transportation to nonproducing districts was so high as to make it impossible to supply the demand in those sections. Since the construction of the railroad from the north to the south end of the island, the cost of transportation has been so greatly reduced that it is possible to ship the fruits cheaply to all parts of the country. This has so stimulated the production and cultivation of pineapples that it has become a profitable industry, and canneries have been built not only to supply the Formosan trade but for export to other countries. One of the largest canneries was established in 1901 at Hozan. The output of this factory for the last five years has been as follows: 1904, 94,400 cans; 1905, 98,000 cans; 1906, 220,000 cans; 1907, 330,000 cans; 1908, 350,000 cans. This cannery also extracts the fiber from the leaf of the plant and uses it in the manufacture of grass cloth. The fiber extracted amounts to about 75,000 pounds annually.

The largest and most extensive pineapple industry in the Pacific Ocean region is in the Straits Settlements. In 1907, 845,900 cases of preserved pineapples, valued at ₱3,576,000, were shipped from Singapore. The declared exports of these goods to the United States amounted to ₱267,064 in 1905, ₱377,012 in 1906, and ₱1,197,540 in 1907.

RICE RAISING IN FORMOSA.

According to Consul Carl F. Deichman, of Tamsui, Formosa, the island has a land area of more than, 8,800,000 acres. The entire eastern half of the island is a rugged mountainous region, and the total area available for agricultural purposes amounts to 1,618,800 acres, of which approximately one-half, or 788,470 acres, are in rice fields. About 64 per cent of the population is engaged in agricultural pursuits. The total rice production for 1907 amounted to 44,760,430 bushels, valued at ₱44,820,000.

DYESTUFFS FROM MANGROVE TREES.

According to the report of Consul O. H. Baker, of British North Borneo, there is quite a prosperous business carried on in that country in the manufacture of cutch. Cutch is a hard, brown, brittle substance and when broken presents a smooth shining surface like anthracite coal. It is used for tanning leather and for dyeing textiles black or brown. Sandakan has a prosperous cutch factory which produced and exported 830 tons in 1907 and 970 tons in 1908, a part of which went to the United States.

Cutch is made from the bark of mangrove trees, which grow in great abundance in salt marshes, extending inland in various places in North Borneo as far as 125 miles. Fleets of small native boats collect and transport the bark to the factories. The trees after being stripped of the bark are, as a rule, cut down, split and chopped for firewood, loaded into small boats, and exported to Hongkong and other eastern ports. The methods of manufacturing cutch are reviewed in the "Commercial Products of India," by Sir George Watt, a new volume published under the authority of the British Government by John Murray, of London.

Mangrove trees are found in great abundance in the salt marshes in all parts of the Philippines, but so far little has been done toward utilizing the bark for the manufacture of cutch, for which there seems to be a good market.

THE SUMATRA TOBACCO CROP.

According to Consul Henry H. Morgan, of Amsterdam, the crop of Sumatra tobacco for 1908 has turned out to be superior in quality to the crop of the preceding year, which is attributed to the fact that it received much rain, whereas the crop of 1907 was planted and grown during a very dry season. The wet season has caused most of the tobacco to be of a good, ripe character, although some of the crop received too much rain, which resulted in making the leaf of a too light and red color, not suitable for the American market. It is generally believed that not much of the 1908 crop of Sumatra tobacco will be suitable for the American market.

UNITED STATES TOBACCO IN CHINA.

According to the report of Consul Amos P. Wilder, the imports of United States tobacco into China for the year 1907 amounted to 4,239,100 pounds, valued at \$923,714, as compared with 4,639,467 pounds, valued at \$1,193,090, in 1906. About one-fourth of the entire quantity of leaf tobacco imported into China goes to the port of Shanghai. This, it is said, is mostly for the British American tobacco factory at that place. With such a large importation of United States tobacco into China it would seem that Philippine tobacco growers should find a larger market for their product in that country.

A REWARD FOR THE EXTERMINATION OF WHITE ANTS.

The government of the Straits Settlements and the Federated Malay States, together with the Planters' Association of Malaya, have offered a reward of £5,000 for the extermination of white ants, *Termes gestroi*. The reward is intended for the destruction of *Termes gestroi* in rubber plantations and not for a mere poison, such as arsenic, corrosive sublimate, or nicotine, which will destroy any insect that happens to be touched by it.

The sole difficulty in exterminating *Termes gestroi* consists in the fact that the main nest lies underground at an unknown spot and from it radiate small tunnels of considerable length by which the termites attack the trees in a plantation. Attempts to destroy them at the point of attack are of little use as the insects can retire underground and begin their attacks on other trees by means of fresh tunnels.

If the government of the Straits Settlements and the Federated Malay States together with the Planters' Association of Malaya succeed in their effort to find a satisfactory method for the extermination of these pests they will be benefactors not only of agriculturists but of practically everyone who resides in the Orient.

PARA DISTRICT RUBBER EXPORTS.

The following statement furnished by Consul George H. Pickerell, of Para, shows the half-yearly exports of rubber from the consular district of Para for the past three calendar years:

Year.	First six months (kilos).	Second six months (kilos).	Total for year (kilos).
1906 -----	20, 138, 124	14, 532, 299	34, 670, 423
1907 -----	23, 407, 858	14, 106, 294	37, 514, 152
1908 -----	22, 293, 064	15, 393, 423	37, 686, 487

A MARKET FOR MATTING.

According to Mr. Harold M. Pitt, matting made in Japan and exported to the United States amounts to approximately ₱6,000,000 annually. This matting is said to be very similar to that made by many Filipinos, and with the use of machinery, such as the Japanese have, there seems to be no reason why the Philippines should not supply this article to the United States and receive the ₱6,000,000 which is now going to the Japanese Empire. Matting exported from Japan to the United States is subject to a heavy duty; with free trade between the Philippines and the United States, Philippine factories should have a great advantage over Japan in supplying this product.

MR. ROOT AND THE PEOPLE OF UNITED STATES.

Mr. Root, when speaking on the tariff bill, properly defined our Philippine policy in proclaiming that—

The good faith, the good name, the honor of the American people are all pledged to lead the people of the Islands on by paths of growing prosperity and capacity for government to the point where they will be capable of supporting and governing themselves. We can not fulfill that high duty by giving them money, as the Senator from Nevada [Mr. Newlands] would have us do. Gifts of money tend to reduce the independence of individual character. We can not fulfill that duty by making the Islands unsuccessful in business, by retarding and confining their industry. We can fulfill it only by giving to them the opportunities to grow in habits of industry, in the building up of national pride and national power, to grow in the accumulation of property and the diffusion of wealth, lying at the foundation of civilization.¹

THE NATIONAL WEALTH OF THE UNITED STATES.

Mr. Willet M. Hays, Assistant Secretary of Agriculture of the United States, has been experimenting for years with the best products of plants and animals, and he states that the national wealth can be greatly increased by seeking out, separating, multiplying, and using the best plants and animal products instead of the common kinds. In this way the United States can save two billion pesos annually, and by giving the boys technical industrial training four billion pesos more can be saved.

THE NATIONAL CORN EXPOSITION.

The National Corn Association will hold its Annual Corn Exhibition in Omaha, Nebraska, on December 6, 1909. The National Corn Exposition stands for the betterment of agriculture. The idea of the corn exposition is to promote the raising of the best corn, wheat, rye, barley, oats, and other grains to supply the market demand. Liberal prizes are offered for the various exhibits and different States are offering special trophies. Six trophies are offered for the best grain exhibits. Three of these are new ones which have a money value of from \$1,800 to \$4,000. No grower has won a trophy at grain expositions who could not get more than double price for his grain, especially corn, from those who are constantly seeking better seed. Last year the three trophies offered were the Indiana trophy for corn, the Dominguez trophy for corn judging, and the Western Grain Growers' trophy for oats. This year Kansas will offer a trophy for wheat, Colorado one for oats, and Wisconsin one for barley.

¹ From The Outlook, June 26, 1909.

THE NATIONAL IRRIGATION CONGRESS.

Mr. James W. Beardsley, former Director of Public Works, was appointed by the Acting Governor-General to represent the Philippines at the National Irrigation Congress which was held in Spokane, August 5 to 12. Mr. Beardsley has been making extensive investigations of the irrigation projects in Java, India, Egypt, and other countries, and will report on these investigations as well as on the proceedings of the National Irrigation Congress.

THE TOBACCO CROP OF THE UNITED STATES.

The latest returns from Government sources indicate that the tobacco crop of the United States will be the shortest known in many years. The tobacco dealers of the States appear to be greatly alarmed over the outlook. The weather conditions and the troubles which have recently taken place between some of the tobacco growers and the American tobacco trust have both tended to reduce the amount of tobacco produced this year. As a result of the work of the Night Riders many people have not planted their fields, and in some sections of the tobacco country little or nothing has been done toward producing a crop during the past year.

Such a condition in the tobacco-growing sections of the United States should arouse and encourage the tobacco growers and manufacturers in the Philippines, and more specially now that they practically have free trade with the United States.

TUSKEGEE INDUSTRIAL INSTITUTE.

The annual report of Booker T. Washington, head of the negro industrial institute at Tuskegee, Alabama, shows that this school is steadily gaining ground both in the concrete results produced, in the shape of trained students sent forth, and in the esteem of the public, North and South. Booker Washington's idea is not to give the negroes scientific or classical book learning, but to train them in the everyday pursuits of life and to teach them that what is needed in this world is sober, steady-going, industrious, and thrifty men and women. Schools of this type are needed in the Philippines to arouse an interest in the common callings and occupations—to stimulate agricultural and commercial progress amongst the common people.

PHILIPPINE CIGARS IN THE AMERICAN MARKET.

A shipment of about 200,000 Manila cigars from the Tabacalera factory and another consignment of 240,000 cigars shipped from this port in June by the Philippines Company, Limited, are reported to have arrived at San Francisco by the Pacific Mail steamship *Korea* and to have been placed on the market in the United States. Another large shipment of Philippine cigars which left Manila about two months ago by a freighter clearing for New York has now arrived at that port.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS, JULY, 1909.

IMPORTS.

Articles.	Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Total.
Rice	(Value)	228,863	124,406	91,246	664,903	5,151	514		1,115,083
	(Quantity)	8,879,568	4,232,557	3,762,845	180,777	160,456	11,840		17,228,043
Beef cattle	(Value)	47,486	1,216	214		85			49,001
	(Quantity)	2,080	50	60		3			2,193
Hogs	(Value)	2					2		2
	(Quantity)	1							1
Eggs	(Value)	23,977							23,977
	(Quantity)	206,380							206,380
Sugar	(Value)	6,470	1,387	851	586	312	48		9,654
	(Quantity)	97,371	19,419	15,116	9,316	4,767	466		146,435
Coffee	(Value)	13,876	2,449	894		28	5		16,286
	(Quantity)	63,758	2,557	4,341	106	1,891	22		71,676
Cacao	(Value)	21,419	2,592	89					24,300
	(Quantity)	88,643	8,513	71					97,232
Raw cotton	(Value)	321							321
	(Quantity)	3,954							3,954

EXPORTS.

	(Value)	Dollars	1, 164, 508	336, 451		310	1, 501, 269
Hemp	Quantity	Kilos	11, 807, 193	3, 273, 838		4, 340	15, 087, 391
	(Value)	Dollars	40, 332	8, 121	365, 804		415, 247
Sugar	Quantity	Kilos	92, 665	18, 181	8, 869, 950		8, 980, 100
	(Value)	Dollars	507, 665	293, 950	15, 200		761, 331
Copra	Quantity	Kilos	7, 313, 344	2, 839, 020	4, 237	11, 952	10, 597, 482
	(Value)	Dollars	113, 929		62, 727	174, 127	119, 922
Tobacco	Quantity	Kilos	830, 553				830, 683
	(Value)	Dollars	101, 000				•101, 000
Cigars	Quantity	Thousands	10, 739				10, 739
	(Value)	Dollars	1, 393				1, 393
Cigarettes	Quantity	Thousands	1, 399				1, 399

AGRICULTURAL CONDITIONS FOR JUNE.

A general survey of the agricultural conditions which have prevailed in the Islands during the last six months will be afforded by the following summary of crop and weather conditions in the Provinces of Albay and Agusan during that period:

At the beginning of the year 1909, the agricultural conditions in both these provinces would have been excellent but for the typhoons which prevailed during the preceding months. Later some unfavorable conditions, such as a lack both of laborers and of work animals, the destruction of some crops by rats, and finally a drought which was quite general, seriously affected the crops in many provinces of the Archipelago.

In Albay: During January and February, rain and wind spoiled the crops in Jovellar, Libon, and Polangi by breaking down the young rice plants in the first two towns and, in the last, the vegetables, which up to this time had presented a fine appearance. The rains very soon gave place to drought, which continued until May, affecting slightly the rice and hemp fields in Calolbon, Pandan, Polangi, Virac, Camalig, and a few other places, but the crops soon recovered and a good harvest was gathered.

Hemp, which is the staple product in Albay, does not seem to have been seriously damaged by the adverse conditions mentioned, and hence Albay was exceptionally fortunate, although the crops in a few municipalities were injured. In February the price of hemp went down to ₱4 per picul and in June of this year the price was ₱5 per picul, the same as in August, 1908. Notwithstanding this, the inhabitants of this province have not been so discouraged as those of other provinces, where they cut down their abaca plants, giving up the industry entirely. Great quantities of this crop are still grown in Albay and statistics for the month of June show that 12,000 piculs were harvested. Corn and coconuts, while of minor importance in this province, have been in good condition during the last six months.

With the exception of rare cases of surra and foot-and-mouth disease reported among horses in Polangi, Libog, and Guinobatan, and the hog cholera in Virac and Malilipot, the condition of the animals is, in general, excellent.

In Agusan: Rice under irrigation at Butuan and Talacogon was damaged by heavy storms and did not recover until harvest time. Then, too, the farmers found themselves without means of plowing their lands, being

short not only of laborers but also of work animals. Work animals were loaned by the owners to their neighbors, but as it was necessary for them to wait until the owners should have finished their own plowing, a great deal of the planting was delayed in this way. When this task was completed, drought came and injured the seedlings, as there was not sufficient water for transplanting. In the month of May, however, abundant rains came on and the young plants began to develop vigorously. They are now in a fairly good condition, although there are many rats to contend with.

In Cabadbaran there were very few rice fields worthy of mention. The hemp industry, which is the most important in this municipality, suffered very much for lack of laborers and still more through the low prices now prevailing. The prices so discouraged the farmers that in many cases they rooted up their hemp plants in order to try other crops. For the same reason, the tilling of abaca has decreased in Butuan and Talacogon, where many fields planted to this crop received no further attention. During the last six months prices have fluctuated between ₱6 and ₱8 per picul in Butuan; ₱4 and ₱7 per picul in Talacogon; and ₱5 and ₱8 per picul in Cabadbaran. Other crops are now in a fairly flourishing condition, except in Butuan, where the cacao trees suffered a little from a malady known as "bugtoc," and some coconut trees from insect pests. The growing of gutta-percha is being developed in this province and the land seems well adapted to its culture. Many trees have already been planted in the municipality of Cabadbaran and are now in excellent condition. Briefly, we can state that the agricultural conditions of the province are fairly good and it is hoped that the showers for the rest of the season will be such as are needed by the growing crops.

During the last six months all the animals in this province have been in excellent condition, no animal diseases have been reported. An epizöotic disease has attacked the fowls, however, causing a large number of deaths.

Rains are now general in all parts of the Islands, and the sowing of rice is in progress in nearly all of the rice-growing districts. An exception to the above is the municipality of MacCrohon, Leyte, where we have been informed many hectares of land are ready for sowing which is still delayed by the absence of rain. In Bagakay, Albay, rice planting was finished during the month of June and in some of the lowlands rice is now being harvested. This is the case in Biñan, Laguna; Inopacan, Leyte; Lacang, Palapag, and Sulat, Samar; Bulusan, Sorsogon; and Gigaquit, Surigao, and the results are fairly satisfactory. In Danao, Cebu, and Dagupan, Pangasinan, rains have been very favorable to all growing crops, which are now presenting a very promising appearance. In Culasi and Patnongon, Antique, and Bauan, Batangas, rice planting began in June and is not yet completed; but in some municipalities, like

Camalig, Albay; San Jose, Antique; and Inopacan, Leyte, the scarcity of work animals prevented the sowing of the seed.

The following extracts from a letter by Dr. David C. Kretzer, of the Bureau of Agriculture, dated August 2, shows the weather conditions in Marinduque on that date:

As a result of frequent rains during July, most of the upland rice fields have been plowed and planted. Nearly all the lowland rice fields have been planted and at this time the prospects are favorable for a good crop. The "hill" clearings have been planted to rice and a straggling crop of corn, which promise a good yield for this method of farming.

Locusts have appeared in several parts of the island, but, so far as I am aware, they have done very little, if any, damage.

In my travels in Marinduque I have not observed any disease of a communicable nature among live stock, with the exception of surra and mange. Surra is apparently subsiding, but with the advent of the rainy season there is a very noticeable increase in the number of biting insects, and the spread of the disease by them is probable.

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES JULY, 1909.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fer- nando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.6	0.3	26.2	8.6	26.9	10.2	28.2	0.0	28.4	0.0	28.4	0.0
2	27.4	1.5	26.5	5.1	27.1	0.5	29.2	11.4	28.2	0.0	28.4	6.4
3	28.0	6.9	26.9	2.5	26.4	6.1	28.4	0.0	28.2	0.0	27.9	0.0
4	27.4	30.5	26.3	6.1	25.3	12.7	29.6	9.8	27.4	0.0	28.0	1.0
5	27.3	37.3	25.2	69.6	26.6	0.0	28.4	7.1	28.1	0.0	28.6	0.0
6	25.3	13.5	25.7	17.5	25.7	5.8	27.2	5.3	27.7	0.0	27.6	7.4
7	26.0	15.7	26.2	9.2	25.3	0.3	26.4	10.4	26.6	4.1	27.9	0.0
8	25.0	33.5	26.6	0.0	26.1	14.2	26.7	15.5	27.2	0.0	29.0	0.0
9	26.9	1.8	27.3	0.0	27.0	0.0	26.6	8.1	27.2	9.9	28.6	3.3
10	26.7	17.5	25.5	25.9	27.4	0.0	26.9	7.1	26.9	0.0	26.1	2.0
11	25.0	51.8	25.5	1.6	26.4	7.4	27.9	2.3	27.5	5.6	29.2	18.3
12	24.5	116.8	25.2	45.1	25.9	0.0	27.6	10.9	27.6	37.6	27.4	8.4
13	27.0	0.5	26.0	15.7	27.0	4.8	25.0	41.7	27.2	6.1	24.8	26.4
14	26.2	0.5	26.2	0.0	27.0	0.0	25.6	0.0	26.9	6.5	26.9	0.0
15	26.9	0.5	27.2	0.0	26.9	10.9	27.2	0.0	27.3	0.0	28.6	9.7
16	26.3	53.6	25.8	0.0	25.4	20.1	23.1	6.4	27.2	31.5	26.9	3.3
17	26.2	0.3	27.0	0.0	26.1	0.8	25.8	11.7	27.4	3.8	27.3	3.7
18	26.8	2.5	27.4	99.8	26.3	11.2	27.4	3.8	25.1	6.6	28.3	1.5
19	25.9	4.8	27.5	11.4	26.3	8.4	27.6	0.8	27.4	0.0	28.2	12.2
20	25.0	10.7	26.4	2.0	26.4	0.0	27.8	5.6	28.0	0.0	27.7	4.6
21	25.4	4.1	26.8	0.0	26.9	0.0	27.8	5.8	26.7	6.4	27.1	4.6
22	26.0	7.1	27.2	0.8	26.4	0.0	27.6	1.5	25.9	0.0	27.4	15.5
23	27.4	0.5	27.6	0.0	26.8	5.6	28.0	0.5	26.6	0.0	28.0	7.4
24	26.0	1.8	27.4	1.3	26.8	1.8	28.8	0.0	26.4	48.3	27.9	51.6
25	26.2	11.9	27.1	4.1	26.6	23.9	27.8	0.3	24.8	82.3	27.6	13.3
26	27.0	2.8	28.3	0.0	27.5	18.0	26.4	25.7	24.6	58.7	26.6	48.3
27	27.6	2.3	28.4	2.3	26.6	44.2	25.8	87.1	25.3	48.8	25.4	83.3
28	28.4	1.0	28.9	0.0	27.7	0.5	24.1	60.5	25.4	14.0	24.8	82.8
29	—	11.7	29.4	0.0	28.2	18.8	24.9	14.5	25.4	68.1	25.2	74.8
30	27.1	2.5	30.0	0.0	26.8	5.1	25.2	3.6	26.9	0.0	25.8	36.3
31	27.9	1.5	28.5	7.4	27.4	0.3	26.8	0.0	27.2	0.0	27.4	0.0

CROPS PLANTED AND HARVESTED AND CONDI- TION OF SAME TAKEN FROM MONTHLY CROP REPORTS FOR THE MONTH OF JUNE, 1909.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Agusan (reports from 3 municipalities):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	150	700	67,500	Liters.
Abaca	Good	10	467	177,100	Kilos.
Coconuts	do			12,000	Nuts.
Corn	do	50			
Albay (reports from 13 municipalities):					
Abaca	do	545	10,432	1,200,991	Kilos.
Rice	do	1,148	180	48,000	Liters.
Coconuts	do			20,000	Nuts.
Corn	do	140	57	16,425	Liters.
Ambos Camarines (reports from 27 municipalities):					
Rice	do	716	357	155,250	Do.
Abaca	do	178	4,090	959,756	Kilos.
Coconuts	do			1,164,000	Nuts.
Corn	do	201	171	38,250	Liters.
Antique (reports from 10 municipalities):					
Rice	do	7,042			
Corn	do		285	151,950	Do.
Coconuts	do			34,000	Nuts.
Abaca	do	5	12	3,163	Kilos.
Bataan (reports from 7 municipalities):					
Rice	do			17,625	Liters.
Corn	Fair	642			
Sugar cane	do				
Coconuts	do			3,000	Nuts.
Batangas (reports from 13 municipalities):					
Rice	do	7,703			
Sugar cane	do	670	3	3,416	Kilos.
Corn	do	875			
Abaca	Fair		10	1,645	Do.
Benguet (reports from 9 municipalities):					
Rice	do	16	149	37,200	Liters.
Corn	Good				
Coffee	Fair		20	1,150	Kilos.
Sugar cane	do				
Bohol (reports from 22 municipalities):					
Rice	do	950			
Corn	do	1,352			
Coconuts	Good			1,545,000	Nuts.
Abaca	do	13	260	40,290	Kilos.
Bulacan (reports from 14 municipalities):					
Rice	do	853			
Sugar cane	Fair	25			
Corn	Good	41	137	67,500	Liters.
Tobacco	Fair	25	31	5,750	Kilos.
Cagayan (reports from 13 municipalities):					
Tobacco	do		825	189,750	Do.
Rice	Good	2,516			
Corn	Fair	3,303	470	280,875	Liters.
Sugar cane	Good	687			

Crops planted and harvested and condition of same taken from monthly crop reports for the month of June, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Capiz (reports from 19 municipalities):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	6,684			
Abaca	do	49	87	32,700	Kilos.
Tobacco	do		59	65,412	Do.
Corn	Good	377	111	148,275	Liters.
Cavite (reports from 6 municipalities):					
Rice	do	72	375	281,250	Do.
Corn	Fair	61	10	15,000	Do.
Sugar cane	Good				
Tobacco	do		2	736	Kilos.
Cebu (reports from 30 municipalities):					
Corn	Fair	16,190	269	294,600	Liters.
Coconuts	Good			983,000	Nuts.
Tobacco	Fair	10	4,848	781,356	Kilos.
Sugar cane	Good	23	48	191,774	Do.
Ilocos Norte (reports from 10 municipalities):					
Rice	Good	283			
Corn	do	2,120	91	196,200	Liters.
Maguey	do	35			
Tobacco	Fair		154	144,532	Kilos.
Ilocos Sur (reports from 18 municipalities):					
Rice	Good	914			
Corn	do	223	698	413,925	Liters.
Tobacco	do		131	27,140	Kilos.
Maguey	do	34	160	38,140	Do.
Iloilo (reports from 13 municipalities):					
Rice	do	5,715			
Corn	do	432	230	95,250	Liters.
Sugar cane	do	50	40	2,024	Kilos.
Tobacco	do		31	2,990	Do.
Isabela (reports from 3 municipalities):					
Tobacco	do			2,300	Do.
Corn	do	868			
La Laguna (reports from 12 municipalities):					
Rice	do	1,930	906	1,461,750	Liters.
Abaca	Fair	7	470	164,450	Kilos.
Coconuts	do			4,746,000	Nuts.
Corn	do	18			
La Union (reports from 9 municipalities):					
Rice	Good	295			
Tobacco	do		318	374,808	Kilos.
Sugar cane	do	65			
Corn	do	371			
Lepanto-Bontoc (reports from 16 municipalities):					
Rice	do	252	512	689,175	Liters.
Corn	Fair	39	144	50,550	Do.
Sugar cane	Good	2			
Tobacco	do		30	11,040	Kilos.
Leyte (reports from 15 municipalities):					
Abaca	do	1,034	2,050	535,601	Do.
Rice	do	1,962	200	450,000	Liters.
Corn	do	995	562	915,975	Do.
Coconuts	do			1,273,000	Nuts.
Mindoro (reports from 6 municipalities):					
Rice	Fair	329			
Abaca	Good	22	35	7,590	Kilos.
Coconuts	do			4,000	Nuts.
Corn	Fair	6	56	45,600	Liters.
Misamis (reports from 4 municipalities):					
Rice	Good	200			
Abaca	Fair	18	63	42,378	Kilos.
Coconuts	do			326,000	Nuts.
Corn	do	603	12	5,250	Liters.
Moro (reports from 5 municipalities):					
Rice	Good	93			
Abaca	do		85	56,988	Kilos.
Coconuts	do			33,000	Nuts.
Corn	do	28			

Crops planted and harvested and condition of same taken from monthly crop reports for the month of June, 1909—Continued.

Province and crop.	Condition.	Planted during month.	Harvested during month.		
			Area.	Quantity.	Unit.
Nueva Ecija (reports from 14 municipalities):		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Good	1,140			
Corn	do	217			
Sugar cane	do				
Tobacco	do				
Nueva Vizcaya (reports from 4 municipalities):					
Rice	Fair			3,000,000	Liters.
Sugar cane	Good	5			
Corn	do	3			
Occidental Negros (reports from 10 municipalities):					
Sugar cane	do	550	360	575,575	Kilos.
Rice	do	2,110			
Corn	do	130	10	7,500	Liters.
Abaca	Fair	26	50	44,275	Kilos.
Oriental Negros (reports from 15 municipalities):					
Abaca	Good	78	210	139,783	Do.
Rice	do	805			
Corn	Fair	1,645		3,750	Liters.
Sugar cane	do	45	25	110,688	Kilos.
Pampanga (reports from 8 municipalities):					
Rice	Good	303			
Sugar cane	do	25			
Corn	do	70	20	30,000	Liters.
Pangasinan (reports from 32 municipalities):					
Rice	do	7,172			
Coconuts	do			303,000	Nuts.
Corn	do	2,296	1,070	912,000	Liters.
Sugar cane	do	72	117	222,008	Kilos.
Rizal (reports from 12 municipalities):					
Rice	do	70	170	534,000	Liters.
Sugar cane	do	205			
Corn	do	126			
Coconuts	do				
Samar (reports from 23 municipalities):					
Abaca	Fair	325	771	244,714	Kilos.
Rice	do	228	2,520	3,408,825	Liters.
Corn	Good	273	133	20,175	Do.
Sugar cane	do	71	29	33,839	Kilos.
Sorsogon (reports from 15 municipalities):					
Abaca	do	499	3,110	570,262	Do.
Rice	Fair	1,514	2,012	752,100	Liters.
Coconuts	do			250,000	Nuts.
Corn	do	762	60	18,000	Liters.
Surigao (reports from 6 municipalities):					
Abaca	Good	48	185	104,363	Kilos.
Coconuts	do			90,000	Nuts.
Corn	Fair		3	675	Liters.
Rice	Good		1,650	2,109,375	Do.
Tarlac (reports from 10 municipalities):					
Rice	do	5,617			
Sugar cane	Fair	10			
Corn	do	35	50	25,500	Do.
Tobacco	Good	8	10	2,300	Kilos.
Tayabas (reports from 14 municipalities):					
Rice	do	3,363	4	6,000	Liters.
Coconuts	do			1,040,000	Nuts.
Abaca	do	35	313	57,684	Kilos.
Corn	do	127	5	1,500	Liters.
Zambales (reports from 8 municipalities):					
Rice	do	2,357			
Corn	Excellent		15	22,500	Do.
Sugar cane	Good				
Coconuts	do			8,000	Nuts.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of rice, abaca, copra, sugar, tobacco, and corn for the month of June, 1909.

NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal.

Province.	Unhulled rice, per 75 liters.		Abaca, per 63.25 kilos.		Copra, per 63.25 kilos.		Sugar, per 63.25 kilos.		Tobacco, per 46 kilos.		Corn, per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Aguian	3.00	2.50	8.00	5.70	7.00	7.00	5.48	4.00			1.50	1.50
Albay	3.50	2.40	9.50	5.00	7.75	6.25	7.50	3.00			3.50	2.50
Ambos Camarines	3.50	2.50	9.00	4.00	10.00	3.00	7.50	3.00			4.50	1.00
Antique	3.18	1.75	22.00	12.00	6.50	5.00	6.00	3.50	25.00	5.00	2.50	1.00
Bataan	2.75	2.00					6.00	3.00			2.00	2.00
Batangas	4.00	2.50	10.00	6.00			7.00	3.00	8.00	8.00	4.00	2.00
Benguet	8.00	5.00					6.00	4.00			3.00	5.00
Bohol	4.00	3.00	11.00	7.50	9.25	7.00	6.00	4.00	25.00	4.00	3.75	2.50
Bulacan	2.60	2.10					7.00	6.00	18.00	10.00	3.00	2.00
Cagayan	4.50	3.50	16.00	7.00	8.00	5.00	7.00	4.00	25.00	4.00	3.00	2.00
Capiz	3.25	2.40	12.00	11.00			7.00	5.00	13.00	16.00	3.50	1.25
Cebu	4.50	2.50	20.00	9.00	9.00	5.00	7.50	5.00	30.00	2.50	2.00	2.00
Ilocos Norte	5.00	3.25			5.50	5.50	8.00	2.50	35.00	2.50	3.00	2.00
Ilocos Sur	5.00	2.70	16.00	12.00	9.20	5.00	7.12	3.00	25.00	5.00	3.00	1.50
Iloilo	5.00	2.50	12.00	5.00	7.00	6.00	5.00	3.50			3.00	2.50
La Laguna	4.00	2.00			6.00	5.50	5.00	3.50	7.00	4.00	3.00	4.00
La Union	3.50	3.50			10.00	10.00	5.00	4.50	8.00	3.50	5.00	2.50
Lepanto-Bontoc	8.00	3.50			8.50	3.50	5.50	4.50	25.00	12.00	2.50	2.00
Leyte	5.00	3.00	11.50	6.00	8.00	5.00	4.00	4.00	20.00	20.00	2.50	2.00
Mindoro	3.00	2.00	9.00	8.00	8.00	6.75	6.00	4.00			2.50	4.00
Misamis	4.25	3.25	10.50	6.00	8.25	6.00	5.50	4.00			2.50	2.50
Moro	3.50	2.25	12.00	8.50	7.50	6.50	4.00	4.00	20.00	20.00	2.50	2.00
Nueva Ecija	3.70	1.25					8.00	2.50	30.00	5.00	2.50	2.50
Nueva Viscaya	3.12	2.12					8.00	2.50	30.00	5.00	2.00	1.50
Occidental Negros	3.12	2.50	11.00	8.00	8.40	6.00	5.50	4.00	30.00	20.00	2.00	1.50
Oriental Negros	5.00	3.00	14.00	6.50	9.50	7.00	5.50	4.00	35.00	30.00	2.00	2.00
Palawan	4.00	3.50	25.00	25.00	5.50	5.50	7.00	6.50	25.00	5.00	3.00	3.50
Pampanga	2.50	2.00					7.00	6.50			2.00	2.00
Pangasinan	5.30	1.70					6.60	5.00	30.00	6.00	2.00	1.50
Rizal	3.00	2.40			7.00	5.00	7.00	5.00			2.00	2.00
Samar	5.00	1.75	12.50	7.50	8.00	5.00	5.00	5.00	20.00	10.00	3.00	2.00
Sorsogon	3.75	2.00	12.50	5.00	6.75	5.50	4.50	4.00	12.50	10.00	3.00	1.50
Surigao	3.00	1.75	12.50	7.00	7.50	6.00	5.00	3.00	7.50	7.00	2.50	1.25
Tarlac	4.00	1.50			4.50	4.50	7.00	6.00	7.00	4.00	2.00	2.00
Tayabas	5.00	2.50	10.50	3.00	6.50	4.00	6.00	4.00			2.00	1.50
Zambales	5.00	1.60			5.00	5.00						

PERIODICALS IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

Everyone interested in the study of tropical agriculture is invited to visit the library and make use of these periodicals.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
Journal of the College of Agriculture, Tokyo, Japan.
Hawaiian Forester and Agriculturist, Honolulu, Territory of Hawaii.
Tropical Agriculturist, Colombo, Ceylon.
Memoirs of the Department of Agriculture, Calcutta, India.
Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
Bulletin of the Department of Agriculture, Kingston, Jamaica.
Journal of the Jamaica Agricultural Society, Kingston.
Journal of the Board of Agriculture of British Guiana, Georgetown.
California Cultivator, Los Angeles, California.
The Rural Californian, Los Angeles, California.
Farmer and Fruit Grower, Jacksonville, Florida.
Louisiana Planter, New Orleans, Louisiana.
Southern Cultivator, Atlanta, Georgia.
Progressive Farmer, Raleigh, North Carolina.
Farmer's Guide, Huntington, Indiana.
Kansas Farmer, Topeka, Kansas.
Farm Press, Chicago, Illinois.
The American Florist, Chicago and New York.
The Feather, Washington, D. C.
The American Thresherman, Madison, Wisconsin.
Oregon Agriculturist, Portland, Oregon.
The Gardener's' Chronicle, London.
Commercial America, Philadelphia, Pennsylvania.
Tropical Life, London, England.
Horn and Hoof, Seattle, Washington.
The Breeders' Gazette, Chicago, Illinois.
The Journal of Tropical Veterinary Science, Calcutta, India.
American Veterinary Review, New York.

REPORTS AND QUOTATIONS.

Crop Reporter, by the Secretary of Agriculture, Washington, D. C.
 Monthly Consular and Trade Reports, Washington, D. C.
 Federal Reporter, New York, N. Y.
 Smith and Schipper's Monthly Report, New York, N. Y.
 Hanson and Orth, Hemp Brokers, Monthly Statement, New York.
 Hemp Market Report, Landauer & Co., London.
 Ide and Christie's Monthly Circular, London.
 Exporters and Importers Journal, Chicago, Illinois.
 Quarterly Summary of Commerce of the Philippine Islands, Washington, D. C.
 Ker & Co's. Price Current, Manila, Iloilo, and Cebu, P. I.
 Weekly Shipping Circular (Sugar), Jose T. Figueras, Iloilo, P. I.

LOCAL.

Official Gazette, Manila, P. I.
 Far Eastern Review, Manila, P. I.
 Philippine Journal of Science, Manila, P. I.
 Weather Bureau Bulletins, Manila, P. I.
 The Philippine Agricultural Review, Manila, P. I.

SPANISH.

Boletín de la Cámara de Comercio Filipina, Manila, P. I.
 Boletín Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Habana, Cuba.
 Boletín de Agricultura, San José, Costa Rica.
 Hacendado Mexicano, El, Mexico, Mexico.
 Hacienda, La, Buffalo, New York.
 Industrias Americanas, New York, N. Y.
 Agricultor Peruano, El, Lima, Peru.
 Prácticas Modernas é Industrias Rurales, La Coruña, Spain.
 Resumen de Agricultura, Barcelona, Spain.

OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
 Bulletin Economique, Hanoi-Haiphong, Indo-China.
 Bulletin du Département de l'Agriculture aux Indes Néerlandaises, Buitenzorg, Java.
 L'Agronomie Tropicale, Brussels, Belgium.
 Boletim de Agricultura, Sao Paulo, Brazil.
 Tamil Journal of South India Agriculture, Madras, India.
 Station Agronomique, Port Louis, Colony of Mauritius.
 Journal d'Agriculture Tropicale, Paris.
 Boletim do Museu Goeldi, Para, Brazil.

THE PUBLICATIONS OF THE BUREAU OF AGRICULTURE.

The following-named bulletins of the Bureau of Agriculture are available for distribution, and will be sent free of charge to any address upon application. Applicants are requested to state whether all publications of the Bureau are desired as issued, or only those specified. The name and address of the applicant should be plainly written and all communications should be addressed to the Director of Agriculture, Manila, Philippine Islands.

FARMERS' BULLETINS.

- No. 4. Preliminary Report on Commercial Fibers of the Philippines. (Spanish.)
- No. 6. Experimental Work with Fungous Diseases of Grasshoppers. (Spanish.)
- No. 9. A few Suggestions on the Cultivation of Cotton. (Spanish.)
- No. 11. The Jute Industry. (Spanish.)
- No. 12. Abacá. (Manila Hemp.) (English.)
- No. 13. The Cultivation of Maguey in the Philippine Islands. (English and Spanish.)
- No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
- No. 15. Tobacco Growing in the Philippines. (English and Spanish.)

PRESS BULLETINS.

- No. 6. The Tamarind. (English.)
- No. 8. Maguey; Propagating Abacá from Seed; etc. (English.)
- No. 9. Agricultural Districts; Control of Rinderpest; etc. (English.)
- No. 11. Seed Distribution; Need of Diversified Farming; etc. (English and Spanish.)

POPULAR BULLETINS.

- No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
- No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)

UNIVERSITY OF MICHIGAN



3 9015 01637 3097

